Electronic MUSICIAN

JANUARY 1987

A MIX PUBLICATION

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Mirage Mod

Stereo outputs and less noise!

Should you buy a clone?

Fancy fuzz for guitar

Hot EQ tips

REVIEWS:

Kurzweil K150,
Atari Sequencer,
Kawai K3/K3m,
Wersi M88,
Unique DBM,
ART MIDI Reverb

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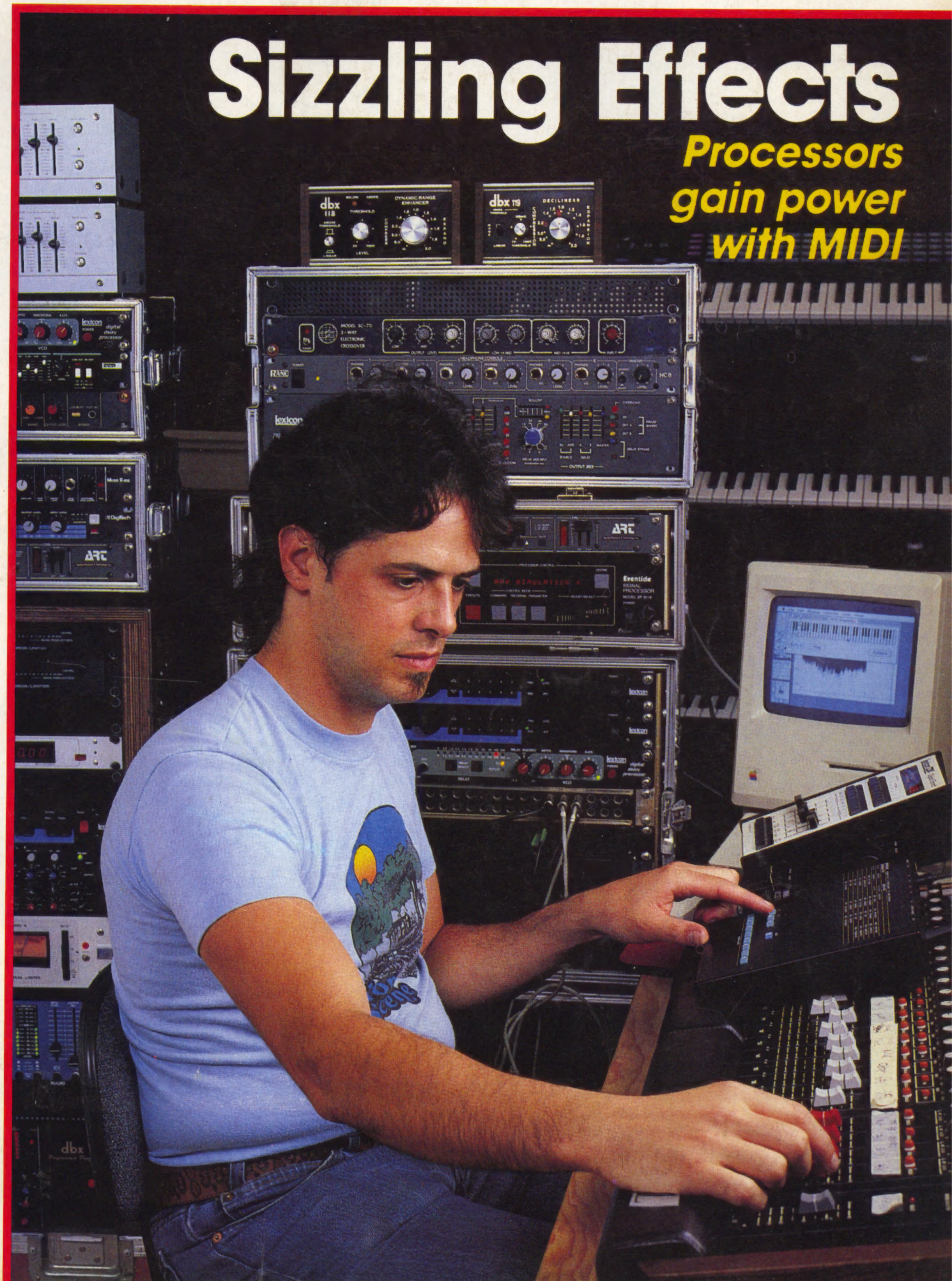

Sizzling Effects

Processors gain power with MIDI

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RECORD MODE PROT:0 USE:001K
BANK 01 SET CTRL TEMPO:125 TIME:04/04

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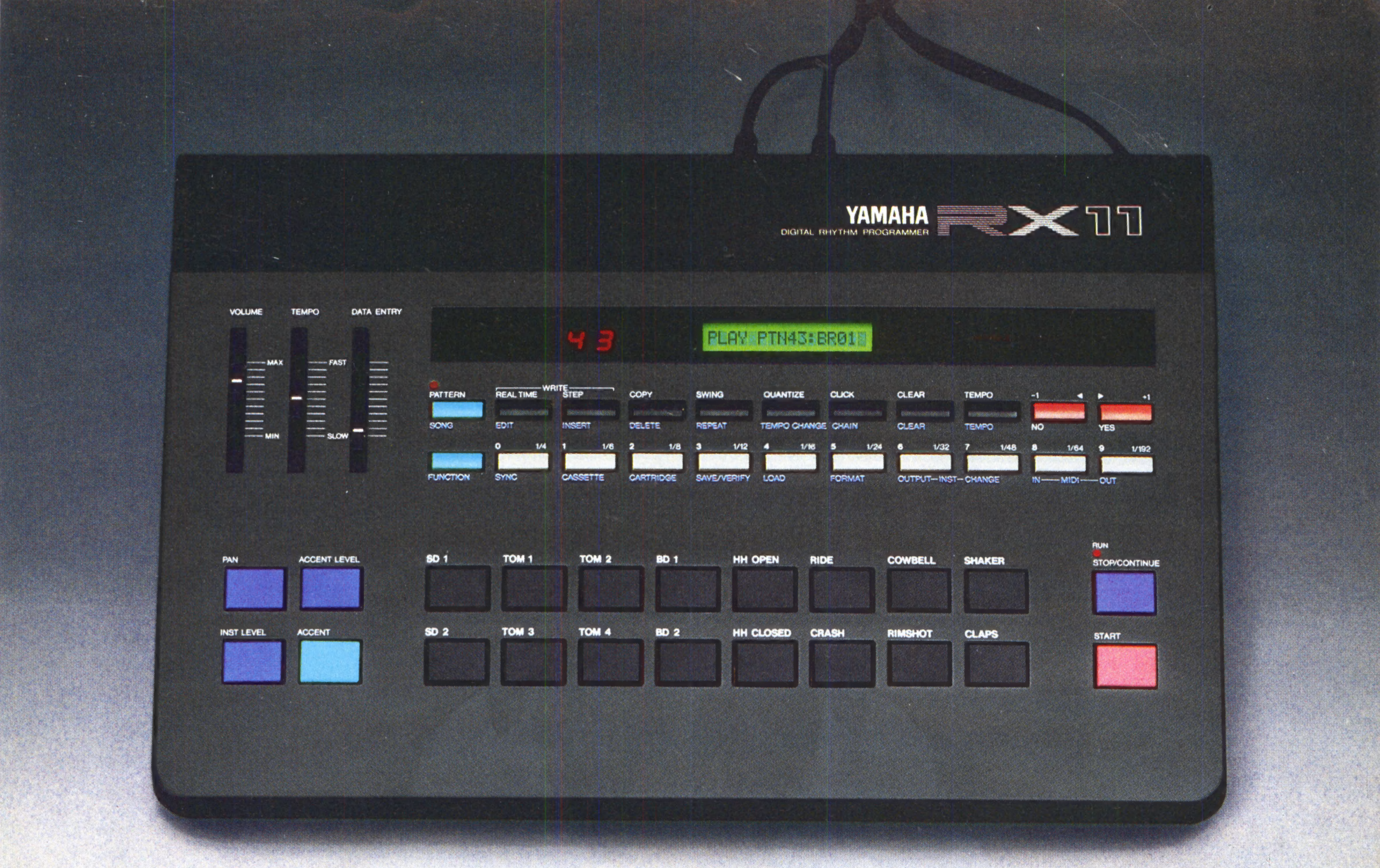
YAMAHA RX11
DIGITAL RHYTHM PROGRAMMER
VOLUME
TEMPO
DATA ENTRY
MAX
MIN
FAST
SLOW
43
PLAY PTN43:BR01
PATTERN
SONG
WRITE
REAL TIME
EDIT
STEP
INSERT
COPY
DELETE
SWING
REPEAT
QUANTIZE
TEMPO CHANGE
CLICK
CHAIN
CLEAR
CLEAR
TEMPO
TEMPO
-1
NO
+1
YES
FUNCTION
SYNC
CASSETTE
CARTRIDGE
SAVE/VERIFY
LOAD
FORMAT
OUTPUT—INST—CHANGE
IN—MIDI—OUT
PAN
ACCENT LEVEL
INST LEVEL
ACCENT
SD 1
TOM 1
TOM 2
BD 1
HH OPEN
RIDE
COWBELL
SHAKER
SD 2
TOM 3
TOM 4
BD 2
HH CLOSED
CRASH
RIMSHOT
CLAPS
RUN
STOP/CONTINUE
START

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For complete information, write: Yamaha International Corporation, Digital Musical Instrument Division, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ont. M1S 3R1.

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VOL. 3, NO. 1 JANUARY 1987

Electronic MUSICIAN

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COVER

A boy and his toys: Larry Oppenheimer, author of this month's feature article on signal processing in live performance, controls the audio mix with one hand while simultaneously using the Yamaha MCS2 to control banks of signal processors via MIDI. Photo by John Helyar.

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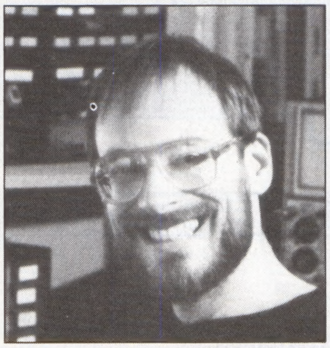
Editor's Note



For many independent musicians, cassettes are *the* medium of choice for disseminating musical ideas; these musicians buy cassettes—sometimes by the hundreds—not to tape other people's music, but to get their own music out into the world. That's why I actively opposed the blank tape tax (as proposed a few years ago), which was supposedly going to help compensate for losses due to home taping. My stand against software piracy and copyright violation is well-known, but being taxed for the privilege of putting out *your own music,* with that tax going to enrich established musicians, was just plain wrong. Thankfully, the proposal was shelved.

Now, however, there is serious consideration being given to slapping a tax on cassette recorders since they have the *capability* to record copyrighted material (whatever happened to "innocent until proven guilty"?). Sure, some people use cassettes to tape copyrighted material. But how many tape records that they have already purchased for use in their car stereos? Or make up "cuts tapes" of their favorite songs from their record collection? In the first case, most reasonable interpretations of copyright law say that once you've purchased something, you have in effect bought a license to use it for your own personal use. With a cuts tape, you're applying creative input to make something for which there is no commercially-available equivalent, so obviously you're not taking money out of anyone's pocket.

If such a tax becomes reality, then what about the problem of distributing the money that's collected? Many people's cassette collections (mine included) consist not of the latest pop albums, but of rare, out-of-print, or independently-produced albums that are impossible to find; you can't buy them even if you try. You can bet that those artists are *not* the people to whom the tax will be distributed. Managing such a tax would be extremely complex—and those who benefit the most will surely be the bureaucrats who administrate the tax.

If this tax money was set up to provide scholarships to needy music students, or donated to research into hearing loss, I wouldn't complain; but I haven't heard about any such lofty goals. Until I do, I won't support such a tax.

Still, we have a real problem on our hands that's going to get worse. The next generation of CD-quality digital tape recorders will copy music with no degradation. Piracy may become even more serious than it is now, and frankly, I don't know what we can do about it. But I do feel that treating people like criminals will only encourage them to be criminals ("well I paid a tax on this thing, so I might as well tape records anyway . . ."). What we need to do is attack the source of the problem, which is a gradual societal acceptance of stealing as an acceptable way to acquire consumer goods. If I knew how to solve *that* problem, I'd be more than glad to tell you. But I don't. The best we can do is maintain our own integrity and have the courage to convince our friends to do the same (if someone asks you to tape a record, explain why this is unethical). However, I do know that slapping a tax on cassette decks won't strike at the root cause of the problem. This "solution" might even damage the music industry far more than help it.

There is something else you can do—urge your Senators and Representatives not to let such a tax become a reality. You can even send a copy of this editorial along with your letter. And, believe it, your voice makes a difference.

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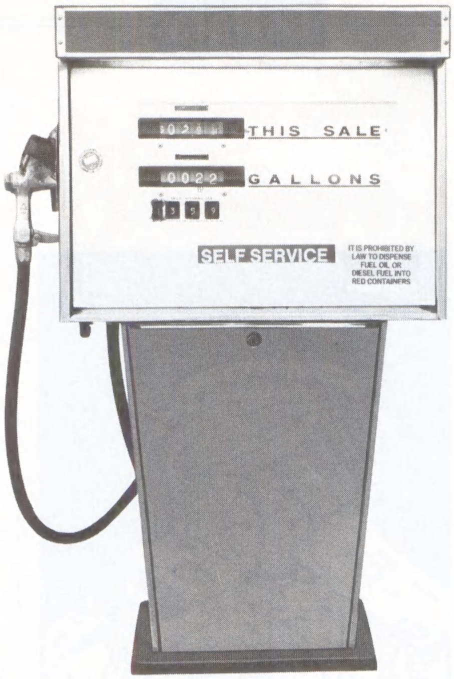
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Letters

Attention Software and Interface Manufacturers!

Please send a complete listing and description of all your music software and computer MIDI interfaces to Peter Vinella, P.O. Box 3339, Berkeley, CA 94703. This is for inclusion in an upcoming article in **EM**.

More Mods!

Many thanks for Alan Campbell's "CZ Mods" in the August "ish" of **EM**. Keep the CZ mods coming! I would be a happy man if I could dump those internal factory presets for more of my own programs. And how about some mods for older synths such as the Oberheim OB-Sx?

Gordon Bland
Webster Groves, MO

We will be presenting more mods for the CZ synths, and for older gear, plus some related special features . . . so stay tuned.

Making Money from Movie Music

Regarding the Alan Howarth article (August 1986), could someone please clarify, in ballpark figures, what a composer of movie soundtracks could expect to be paid? Is it a flat fee or do you receive points? I was taken aback by the fact that he seemed to still have to really hustle for his contracts, especially considering the long list of blockbuster movies on which he has worked. I think if you would have *acted* in all those films you would be on easy street, and certainly would have an agent!

Scott Halpin
San Francisco, CA

We forwarded your questions to Alan Howarth, who responded: "Under most conditions, the means of payment for a movie score is usually a flat fee. Depending on the film you're working on, that fee can vary between about $5,000 to $100,000. In my situation, it works a little differently in that I am a composer with a studio. When I quote a fee, it also includes all the studio time. When a composer who doesn't have a studio quotes a rate, there are going to be a lot of other expenses, which constitutes the overhead. If the composer goes over budget in the studio, the extra comes out of that fee. There are many people who have actually ended up paying money out of their pocket to do a score because they wanted to get into scoring!

"Concerning agents, they only take the cream of the crop of film composers and I guess I haven't reached the upper 1% yet. Also, the guys who have made a name for themselves in the record business like Vangelis, Peter Gabriel, and Jan Hammer also have a better chance of getting an agent. This is one of those businesses where you have to expect the worst and when it isn't that bad you get happy."

Controversial Carlberg

It has been years since I have been as profoundly disturbed by an album review as I was by Robert Carlberg's review of Peter Gabriel's *So* (Oct. '86). The labels "popgod" and "mainstream rocker" seem sadly inappropriate to describe one of the most underrated artists of our day. It is hard to believe that Mr. Carlberg is content to describe such a diverse collection of musical ideas as a "Motown album in style, form, and production."

To summarize the work of electronic musician Larry Fast and the contribution to the field of synthesis made by a sensitive, stylistic work such as *So* as an album with "a few electronic signatures" is a baffling oversight. That such an oversight was voiced within the pages of **EM** borders on criminal. Perhaps the most curious and disturbing idea presented in Mr. Carlberg's review is that of Peter Gabriel "listening to Phil Collins." Is it possible that any sound mind could entertain the notion that Phil Collins, a man truly deserving of such labels as "mainstream" and "popgod," influences the lyrical and compositional subtleties of Peter Gabriel? I urge any reader discouraged by Mr. Carlberg's review to give this work the attention it deserves.

Gregory P. D'Andrea
Oakland, CA

Gregory—I like So *too. Frankly, I don't always agree with Robert; but that's what opinions are all about. Gabriel himself has mentioned that his latest album is a change in direction, and clearly, Robert thinks it's a change in the wrong direction. I've done concerts (and albums) where one critic would think the music was great, but another would think it was terrible. The music was the same; it was the perceptions that differed. With the arts, objectivity is a difficult, if not impossible (or necessarily desirable), goal to obtain.*

Several readers have written to say that they feel Robert is too hard to please, and should give more favorable reviews. As editor, I have two responses. One is that believe it or not, being a critic is difficult. You get sent zillions of albums, many of them amateurish, many of the them overproduced, and many of them accompanied by a frenzied PR person trying to hype you on the merits of a particular act. When faced with this kind of sonic overload, only the most original and fresh albums stand out. (Even Gabriel has talked about the Motown influences in his album; critics don't like to hear what they've heard before, no matter how well done.)

Most importantly, although I enjoy many albums Robert doesn't, when he recommends an album, I know it's going to meet high musical and technical standards. Robert recognized the talents of people like Don Slepian, Larry Fast, Neil Nappe, Richard Burmer, Laurie Anderson, Dave Stewart, and many others before the "hip" world caught on.

Please, don't get upset by what Robert—or any critic—says. Critics just offer opinions, and different people have different tastes. Yes, it's hard to please Robert; but a tough reviewer can be helpful. Reading a page of reviews that essentially say "gosh, isn't all this stuff absolutely fabulous" doesn't stimulate discussion, and doesn't give people any kind of perspective on what music they might like. The best aspect of Carlberg's column is that he throws the spotlight on deserving artists, even if they're just sending out cassettes on their own label. I've bought several obscure tapes and records based on Carlberg's recommendations—music I might not have even known about otherwise—and have not yet been disappointed.

Concerning the "oversight" of Larry Fast's contributions to So, *for the record, although Larry was credited on that album, none of the tracks he recorded are actually on* So *since Peter decided to take a new musical direction; this is the first Gabriel solo album without Larry's influences. That probably explains why Robert feels the electronics lack the depth we've come to expect from a Gabriel album.*

CZ Snake?

After reading about the MIDI/power cable mod in Alan Gary Campbell's *CZ Mods* article, I began wondering if you could extend this idea to construct a "snake" that would carry the DC power, MIDI, *and* audio signals. How about it, Alan?

Greg Laudeman
WDSI
Chattanooga, TN

Roland Electronic Percussion Workshop Session 1

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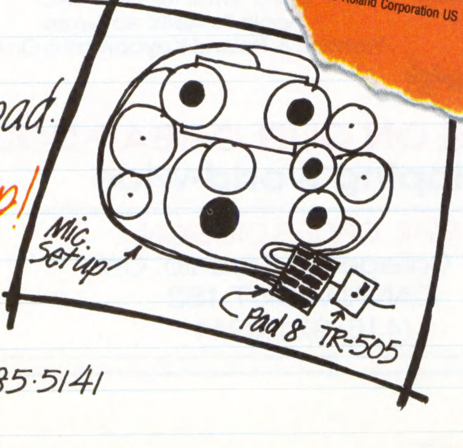

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Alan replies: "Actually, you can do this, using a MIDI connector mod. The DC supply ground and audio ground are tied together inside the '101, so you can use a single, common ground for these in the snake. This ground can attach to the case-connection of the MIDI jack, thus leaving the five DIN connector pins free for the MIDI send/return, audio send, DC receive, and cable-shield connections. However, the MIDI, audio, and supply leads are then in close proximity to one another, thus degrading the output signal-to-noise ratio and reducing EMI (electro-magnetic interference) rejection; and the mod can place a considerable strain on the MIDI Out jack, due to the weight of the special cable. Also, the multi-conductor cable required can be hard to find and expensive.

"This mod is described in detail in the Nov/Dec '86 issue of Cozmosynth, *the CZ/budget synth newsletter (see User Group Listings). Interested readers might want to contact the magazine concerning back issues or subscriptions."*

Studio II Update

Much to my surprise, I saw a review of Studio II, a program Marshall Otwell and I completed over a year and a half ago, in the October issue. Around March, Marshall and I took all the suggestions we had received from Studio I and II users over the previous year and started development of our new "Super" Sequencer series which is now completed. These programs, available from Sonus for the Apple IIe and Commodore-64/128, have about twice the features of the old Studio series and make use of 128K of memory (for the C128 and Apple IIe with extended 64K memory card) to provide about twice as much usable sequence memory (sequence memory being critically important). We **EM** readers are accustomed to **EM** giving us a glimpse of the cutting edge of the art. Seeing a current review of Studio II was a little like coming across a product release on the DX9.

A possible solution to this problem could be to contact the authors of programs under review, if only to see if any revisions are in the works or to be sure you have the latest version of the program. It seemed a bit curious that no mention of authorship, which might be a point of interest to your readers, appeared anywhere in the review.

Tim Ryan
Laguna Beach, CA

Tim—As a fan and user of your programs, I regret that information about the upgraded Apple sequencer from Sonus did not appear in the October issue. However, at the time of writing the review, author Jeff Burger was told by Sonus that introduction of the program was 60 days away, which put it well past the issue's July 1 deadline. Mention of the program was made in the next available issue (November). In any event, I would recommend that Apple II owners look into the Sonus SuperSequencer for the Apple; I have found the equivalent version for the Commodore-64 to be an excellent program.

The point about contacting software authors is valid. However, often when we do this we are told of a great addition or new program that's "just around the corner." Sometimes these programs pan out, sometimes they don't, and sometimes unexpected delays occur that postpone the program's introduction. Although we like to stay on the cutting edge, we must also consider what's available right now. In our quest for editorial accuracy, we try to avoid mentions of "vaporware" whenever possible. This policy, combined with our attempts to have reviews written by end users who have worked with a product for several months so that they can include useful applications tips, makes it impossible for us to publish reviews as early as other magazines that do not follow these criteria; we feel that in the long run this will be more helpful to our readers and advertisers than publishing articles about products that do not yet exist in final form. Aside from this, I fully agree that software authorship should be mentioned in reviews, and we will endeavor to include this information in upcoming software reports.

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Error Log

The parts list section for "CZ Mods" (August **EM**) states that the Panasonic AN7909 Negative 9 Volt IC Voltage Regulator is available from Digikey. At present, only the AN7809 *positive* regulator is available from this source. Alan Campbell reports that the more common National Semiconductor LM7908 and LM7808 8 Volt regulators may be substituted with only a slight loss in circuit headroom.

In "The Musical Apple II" (October), "The Non-Musical Apple" sidebar incorrectly identifies I-tek, a nonexistent company. This entry was the result of a garbled data transmission and should be deleted.

In "The Serial Nature of MIDI" (July), it was incorrectly stated that the MIDI data start and stop bits are both at logical one. The start bit is always 0 and the stop bit is always 1. For more information on the subject, see Tim Dowty's "Small Tock" article in the April '86 issue. Thanks to Lachlan Westfall from the IMA for bringing this error to our attention.

OK, gang, **pull out your back issues and write these corrections in the margins** so that your **EM** files will be complete and accurate.

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Roland

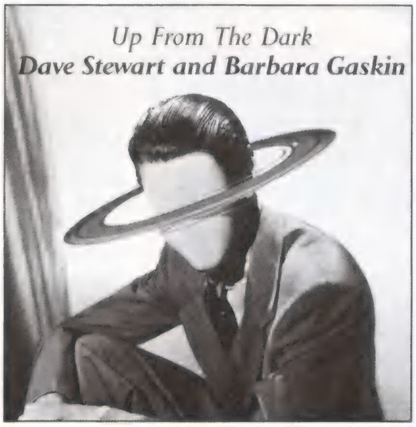
Best Stuff!

Released and Reviewed

BY ROBERT CARLBERG

Send records, tapes, CDs, and music videos for review to Robert Carlberg, P.O. Box 16211, Seattle, WA 98116.

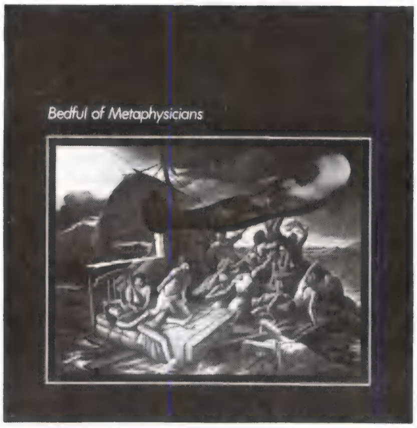
Peter Schaefer, *Hevron* (Farn 18003). Schaefer's third LP documents his vacation to Israel with on-location recordings and Middle Eastern-influenced electronic music. PPG Wave 2.2 and SCI Drumtraks are the main instruments, sounding very full and varied in a dozen tunes journeying from sound experiments to rock-outs. If you've only tasted major-label electronic music you owe it to yourself to check out the real stuff. 22 Deutschemarks (about $11) from Peter at C. L. Schleich Str.5, D-7518 Bretten, West Germany, or contact EUROCK Distribution, P.O. Box 13718, Portland, OR 97213.


Up From The Dark
Dave Stewart and Barbara Gaskin

Dave Stewart and Barbara Gaskin, *Up From the Dark* (Rykodisc 10011); CD only. Dave Stewart is the keyboard king of Canterbury (though he is not the Dave Stewart of Eurythmics, as he emphasizes). Some of his former projects include Uiel, Egg, Khan, Hatfield, National Health and Bruford. Ms. Gaskin was a Northette as well as a member of Spirogyra (not the jazz Spyro Gyra however) and a group called Red Roll-On, which promptly broke up as soon as they were noticed. For the last five years the two of them have been tickling the British charts with light-hearted remakes of some of their favorite songs, among them "It's My Party" (which hit # 1), "What Becomes of the Broken-Hearted," "Busy Doing Nothing" and "Siamese Cat Song" (from *101 Dalmations*). Reviewing one of these singles for *Polyphony* in December 1984, I wrote "Quit teasing us—a whole album would be nice, Dave." Almost two years later Rykodisc has finally done the next best thing: collecting most of the singles and a half-dozen originals on a compact disc. This stuff isn't quite as progressive as Stewart's earlier material but if there's any justice, it'll cause Americans to associate Barbara Gaskin instead of Annie Lennox with Stewart's name.

***Robert Carlberg** is the national service manager for Audio Environments, Inc., a nation-wide supplier of original-artist music for restaurants and fashion stores. His hobbies are electronics and music, and particularly electronic music.*

Andreas Vollenweider, *Down To the Moon* (CBS 42255). Swiss New Age jazz harp music that also makes use of synthesizers and nature recordings. You won't learn anything new from listening to this recording, but there are no rude surprises either.



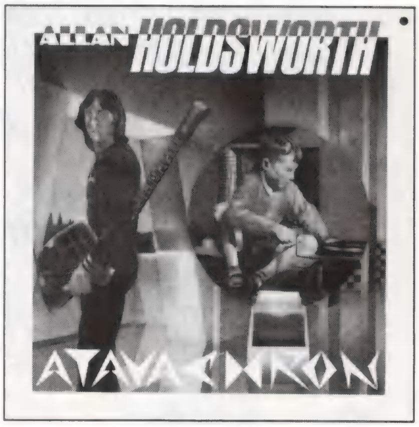
Bedful of Metaphysicians, *Bedful of Metaphysicians* (Digitek B2786). A fun bunch of guys with names like Dirt Condominium, Burma Diode and Kid Trousers singing fun songs with lines like, "I'm repentin' my unmilitary mood now that war's got good reviews" and "We know burning candles at both ends yields twice the light but half the life, so at halftime we quit." Indeed. They're almost too literate for the broadsword of satire, and they've earned their underground reputation. $8 from RD 1 Box 276, Danville, PA 17821.

Keith Kiser, *Transient* (Whistlefield 125B). Lou Reed, The Kinks, Bruce Springsteen, Rick Springfield, John Cougar and George Thorogood come to mind listening to this album. That it's not terribly original is not the point—it's easily as good as any (or all) of the above, and you've probably never heard of guitarist/singer/songwriter Keith Kiser. Don't blame me. Whistlefield Records, 113-A Nelson Avenue, Melbourne, FL 32935.

Swinging Pistons, *I Love the Sound of Machines* (RD3 002, 12-inch Single). A rarity among 12-inch dance singles: the independent production. This one was recorded on a Tascam 38 with a MIDI stack and Oberheim DX Drumbox. The singer, Judy Jones, multitracks herself until she sounds like the Pointer Sisters while Andrew Gomory and William Tucker lay down funky electric bass, some guitar licks and digital drums—lots of digital drums. The hook is a little phrase on tuned percussion which sounds like maybe bicycle spokes, and there's also banging on some other junk that comes and goes. Very pro, lots of changes and it's a hit in Trenton that could spread. RD3 Records, 82 Mountain View Road Belle Mead, NJ 08502.

David Bell, *Ultra-Glide* (cassette). The remarkable thing about this tape (perhaps the only remarkable thing) is that it was performed live without overdubs through the use of a Commodore-64 loaded with a Syntech sequencer. Other than that it's fairly normal-formal, 4-track jazz-rock on drumbox and keyboard synthesizers using organish voices and shopping mall organ-store arrangements. At his best he ascends to a Stevie Winwood fluency. At his worst he slides into a Leon Lowman formula. As they say in the biz, he's got loads of potential. $6 from System One Data, 109 Yaupon Drive, Morehead City, NC 28557.

Jonathan Best, *The Invisible Man* (cassette). Technically, Best isn't a very good singer, and with lyrics like, "Your kisses taste like cherry wine" and "Cheerios, Cheerios, I had a couple of bowls of those," he's not exactly a world-class lyricist, either (although Adrian Belew gets away with worse). But he's careful to sing within his limitations and he creates some effective and highly engaging backing tracks using minimal equipment (two Casios, a DX7 and a Roland TR-707 drumbox) so that by the end of the tape, you're rooting for the underdog. In fact, given proper production, a couple tracks might have chart potential. $6 from 2350 Broadway, Suite 412, New York, NY 10024.



Allan Holdsworth, *Atavachron* (Enigma 73203). Jazz/rock guitarist Holdsworth is one of the pillars of the progressive though he usually sounds better serving another master than himself. Luckily, *Atavachron* is 6/7ths instrumental fusion jazz of the type best suited to him and it features the SynthAxe, a $14,000 (fully loaded) synthesizer controller for guitar players (pictured in the April issue). The tension between the slow, humable themes and

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the rapidfire bursts of lightning-fast notes (Holdsworth's trademark) makes the album recommendable to everyone from metalheads to loungers.

Robert Wyatt, *Old Rottenhat* (Gramavision 18-8604). Robert Wyatt's an acquired taste. Since his classic *Rock Bottom,* which he wrote whilst laid up in a hospital, Wyatt's output has tended to be rather depressing and ascetic. *Old Rottenhat* is no exception, with just Wyatt's labored lyrics over skeletal synthesizer and percussion backing.

Various, *Music From Mills* (MC 001). Sometimes a compilation just isn't a very good idea. Mills College in Oakland has been the "home away from home" for so many composers from so many different styles over so many years (this album celebrates their centennial), that no compilation can hope to cover the scope, let alone do it with any continuity. This anthology was chosen and compiled by Mills' current music director, David Rosenboom, and his choices don't help any. Lesser-known promising artists are "excerpted" while better-known, if not necessarily better, material from established names like Steve Reich is reproduced in full. In addition, jazz juts up against abstract, squawky cuts to make no side listenable *in toto* for anyone who doesn't adore both. Three-record set for $18, Mills College, Oakland, CA 94613.

Equinox, *Equinox* (cassette). Equinox consists of two students of Sri Chinmoy: Premik Tubbs (sax & flute) and Shambhu Vineberg (hollow-body electric guitar), improvising off tunes by their guru. The simple instrumentation brings "New Age Music" back to a wide-eyed guilelessness. Usually slow and haunting, a couple times per side they'll slip into some fast unison playing *a la* Chick Corea or John McLaughlin. Vineberg Communications, 164-03 85th Avenue, Jamaica, NY 11432.

Neal Davis, *Alone Together* (Creative Energy 1001, cassette); ***Above the Clouds*** (Creative Energy 1002, cassette); ***Creative Energy*** (Creative Energy 1003, cassette); ***Solo Piano*** (Creative Energy 1004, cassette). Here's an interesting idea. These four tapes present four different sides of multi-instrumentalist Davis. Taken together they paint a portrait of a remarkably talented performer. *Alone Together* is an E-Z listening, FM contemporary approach, with six glib vocals and seven instrumentals on piano, synthesizers, guitar, vibraphone, bass and percussion (overdubbed). *Above the Clouds* is a "jazz lite" affair, featuring acoustic guitar and piano solos over the above instruments. Very smooth and easy. *Creative Energy* is his synthesizer tape, using digital drums and a more upbeat style to fit right in with the current "post-electronic jazz." *Solo Piano* is, well, guess. $6 each from P.O. Box 6232, Omaha, NE 68106.

Dennis Hendricksen, *Eclectic Images* (APT 02; cassette). Hendricksen is also a multi-instrumentalist, playing synthesizers, electric and acoustic pianos, guitar and bass guitar, flute and percussion. All are played to perfection. His music, composed over the last few years, generally builds pleasant jazz-tinged melodies over bouncy drumbox rhythms, augmented on half the tunes with real drummers/percussionists. Trumpet, sax and guitar guests also help fill out a brimming-to-overflowing musical offering. $7 (Canadian) from 2230 Elphinstone Street, Regina, SK, Canada S4T 3NB.

Michael Manring, *Unusual Weather* (Windham Hill 1044). If John Abercrombie is the epitome of ECM, then bassist Michael Manring is the epitome of Windham Hill—and they're quite similar. In addition to his atmospheric fretless bass, Manring plays piano and synthesizer, and producer Bob Read plays saxes, flute, piano and synthesizer. Their gentle evocative themes and diversions add up to some very beautiful mood-enhancers.

John Abercrombie, *Current Events* (ECM 1131). Abercrombie's economical guitarwork (electric, acoustic and synthetic) is the epitome of the ECM style. Peter Erskine and Marc Johnson help out. Aside from one "free jazz" blowout on one side, this is his most tuneful outing in years.

Nightcrawlers, *The Largo Tree* (cassette). The Nightcrawlers usually explore soundfields opened by Tanagerine Dream, but this tape "is somewhat of a departure" for them. This synth trio still builds long, flowing improvisations out of sequencer frameworks, but the sounds are darker and the rhythms a little headier than their mentors'. $4 from 1493 Greenwood Avenue, Camden, NJ 08103.

Control Voltage, $F_c = \infty$ (cassette). Somewhat like the Nightcrawlers, D. Andrew Rath takes sequencer patterns that change keys every few bars and modally improvises over the top. Unlike T.D. and the N.C.s, he steps outside the conventions which have grown up around this style, dropping some low-register grumblings into his improvs, some slippery-pitch passages, etc.—generally goosing up a geriatric genre. Those of you who coughed up $6 for his *Apex* (June) or *Mind Pictures* (July) probably won't mind his new price of $8 (for high-bias) or $11.50 (metal) for any of the above. His recordings can justify it. 58 Marboro Lane, Willingboro, NJ 08046.

Various, *First Edition—The Audion Sampler* (Audion 105). Audion is Larry Fast's new label, and the initial seven offerings are summarized in this sampler. Audion will be devoted "exclusively to state-of-the-art electronic instumental music" and available in all three formats (LP, tape and CD).

CATSPAW
EMERALD WEB

Emerald Web, *Catspaw* (Audion 100). Long-time **EM** buffs will recognize Emerald Web from their nine previous releases: *Dragon Wings and Wizard Tales* (LP), *Whispered Visions, Sound Trek, Aqua-Regia, Valley of the Birds, Lights of the Ivory Plains, Nocturne, Love Unfolding* (all cassettes), plus their videocassette *Photonos.* Throughout their 13-year history, the duo of Bob Stohl and Kat Epple have always been known for combining their flutes and synthesizers in somewhat saccharine but heartfelt New Age phantasmagorias. *Catspaw* is another chapter in the same book.

Barry Cleveland, *Mythos* (Audion 101). Guitarist Cleveland is assisted on this album by his long-time collaborators Emerald Web along with cymbalom-player Michael Masley. Cleveland himself does everything but play the guitar straight; he uses E-Bow, violin bows, Thumbo and the cymbalom's Bowhammer to elicit long droning chords from his instrument. Side two is a 19-minute Frippertronics loop, with flutes, bells and cymbalom floating in and out. Very empyrean.

Steps Ahead, *Magnetic* (Elektra 60441-1). One track sounds for all the world like Spyro Gyra, one features banjo of all things, one has a Crusaders-like vocal, and most of the rest sound like *Mysterious Travellers*-era Weather Report, back when they were lyrical. No doubt about it, Steps Ahead have grown up. They're still one of the few jazz groups to use synthesizers and sequencers extensively, but they're edging perilously close to "corporate jazz."

Leo Kottke, *A Shout Toward Noon* (Private Music 2007-1-P). Continuing the departure away from pure electronics that Lucia Hwong represented, Private's latest issue includes the deacon of fingerpicking. Two songs are rearrangements of previously-released tunes, a few feature cello or synthesizer backdrops, and the main voice is Kottke's patented multi-part acoustic guitar. In keeping with the "Private sound," Kottke does not sing and most tracks are of the nebulous non-rhythmic style he does so well.

Yanni, *Keys to Imagination* (Private Music

—page 19

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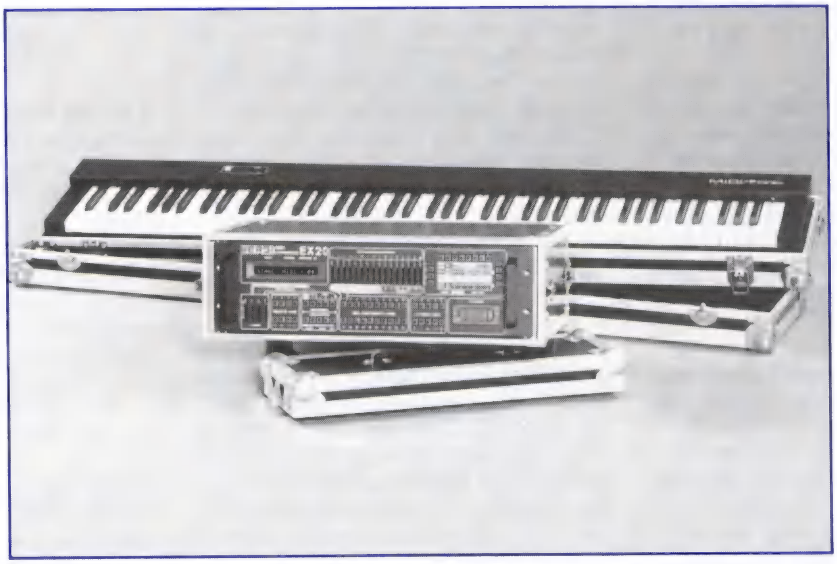

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Attention User Groups! *To be listed in* **EM**, *simply describe who and what you are: name, address, phone, areas of interest, membership dues and qualifications (if applicable), and services offered to members. Notice of specific, dated events must arrive at* **EM***'s offices three months prior to the cover date. (For example, we would need to know by November 1 about any meetings planned for February.)*

To be listed every month, you must notify us every month that you're still active. Sorry to put you to the extra effort, but otherwise we have no idea of which groups are still around. Send info to User Group Listings, **EM**, *2608 Ninth St., Berkeley CA 94710. There is no charge for this service.*

Note: **EM** cannot check into each of these organizations. Call or write first for additional information (or go to a meeting) before sending any money to any users group.

▶**AMUG, the American MIDI Users Group**, sponsors monthly meetings, is building a database of MIDI information, and publishes a monthly newsletter. On-line communications with AMUG are handled through the Dallas MIDI Users Group (DMUG) BBS at 214/276-8902. Membership is free to composers, music publishers, MIDI-oriented stores, studios, manufacturers, and publishers of MIDI-related books and periodicals. For a membership application, write to:

7225 Fair Oaks, Suite 515
Dallas, TX 75231
214/272-0963 or 214/987-2940

▶**AMuse**, the New York City Amiga Users Group, is a non-profit organization dedicated to the support of users of the Amiga personal computer in the New York City area. Regular meetings are held twice a month, and cover all aspects of the Amiga. AMuse publishes a bi-monthly newsletter, maintains the first New York Amiga music Special Interest Group (AMusic), and runs a bulletin board at 212/269-4879 that features several message bases; also, over 300 software files are available for downloading. The AMuse bulletin board is on line from 5 a.m. to 3 a.m. every day. AMuse meets every other Tuesday night at 7:30 p.m., in the School of Visual Arts amphitheatre (third floor, 209 East 23rd St, between Second and Third Avenues). Meetings are open to everyone. For more information, call 212/460-8067.

▶**Atari Computer Club of the Palm Beaches** meets the second Tuesday of each month at 7 p.m. in the Science Museum and Planetarium at Dreher Park, West Palm Beach, FL 33405; tel. 305/632-1988. Their 24 hour, 300 Baud BBS is available at 305/734-6026; their newsletter, The Pokey Press, is published monthly. For subscriptions and membership info, write:

Subscription Manager
15545 S. W. 151th St.
Indiantown, FL 33456

▶**Casio CZ Users International** (CZUI) encourages open dialog among both entry level and professional users of CZ series synthesizers worldwide through its bi-monthly newsletter, *Cozmosynth*. This features tutorials, hardware and software reviews, tips and modifications, an ample CZ patch section, advanced applications, and general discussions relating to getting the most out of CZ synthesizers and associated gear. **CZUI** membership is $18/yr. and includes a subscription to the newsletter. Personal or group listings in the newsletter for CZ users who want to contact other users are free to members upon request. For more information or a sample issue of *Cozmosynth* ($3) write to:

Dream Machines Inc.
P.O. Box 1033
Grover City, CA 93433.

▶**Champaign/Urbana MIDI Users Group** meets on the third Thursday of every month at 7:30 p.m. at C.V. Lloyd Sound System Products, 102 S. Neil, Champaign, IL 61820. Discussions include applications, problems, and the future of MIDI. We have new product demos every month. As of now there is no membership fee; all are welcome. For more information call 217/352-7031.

▶**Canadian MIDI Users Group** (CMUG) publishes a bi-monthly newsletter that includes articles, news, and a classified and contact section for members only. Annual dues are $20 (Canada) and $25 (all others). They recently introduced MIDILINE, a 300/1200 Baud service that works through FidoNet. For more information write:

Box 1043
Belleville
Ontario, Canada K8N 5B6
613/962-0549 or 613/962-0603

▶**CX5-US Users Group** maintains a 1200+ voice library, available upon joining, for the CX5M. A number of public domain games, utilities, and programs are also in the library. Monthly meetings are held the first Tuesday of each month at the address below at 8 p.m. Kevin Bierl, a Telephone Service Representative with Yamaha, is generally present to answer questions. A newsletter is also distributed on an irregular basis. Membership fee is $20/yr. Contact Mike Dwyer at:

5218 Scott St.
Torrance, CA 90503
213/540-3758

▶**DJ/VJ Information Network**: Club Disc Jockeys, Studio Remixers, and Mobile DJs (not radio DJs!) can log on to our computer using their personal computers to learn more about music, computers, and how they affect our segment of the business. Guest artists are welcome for online conferencing; contact our offices during normal working hours for consideration and log on time. There is a small yearly maintenence fee of $50. The network telecommunications protocol is seven data bits, one stop bit (or eight data bits, one stop bit) and either odd or no parity. It supports all popular XMODEM protocols, at either 300 or 1200 Baud. Contact:

George B. Tselentis
Electronic Products Inc.
5078 So 108th St.
Omaha, NE 68137
402/339-5803

▶**The DX User** is a user group for the DX7 synthesizer. A newsletter is published on an irregular schedule, and members trade original voices for the DX7. The newsletter includes tips on hardware, software reviews, patches, opinions, and so on. Patches are available on paper, and in a variety of disk formats. For more information and a sample issue describing the group and its functions, send three 22 cent stamps to:

The DX User
P.O. Box 209
Woods Hole, MA 02543

▶**MIDI Applications Group** shares information concerning current uses of hardware and software systems. Meetings are held the first Saturday of each month. This group focuses primarily on "state-of-the-art" applications rather than strictly theory or topic reviews. Forums for information exchange include a newsletter, monthly meetings, seminars, and featured audio selections (available on cassettes). A mailing list of interested individuals and groups will be assembled and the premier issue of the newsletter *MIDI Milieu* will be available soon. There is a $5 yearly sign-up fee for individuals, and $20 for groups. For more information contact:

John or Gay Komenlic
c/o The "M ROOM"
1411 Tenth Avenue
Oakland, CA 94606
415/465-6216

▶**New York CX5M Users Group** has an extensive program and patch library and holds regular meetings. For more information, write to:

551 Central Ave. (Suite 22B)
Cedarhurst, NY 11516
516/295-1427 or 718/461-8057

▶**Northwest Electronic Musicians (NEMUS)** is open to anyone interested in any kind of electronic music from tape techniques and musique concrete to analog, digital, hybrid and samplng synthesis. They also address peripheral topics such as signal processing and the uses of PCM recording. There are no dues, but a monthly newsletter is available for $8 per year. Meetings are the first Tuesday of each month at the Dutchman Studios, 101 S. Spokane, Seattle, WA 98134. Contact members Steve Ditore 206/632-2103, Gary Mula 206/343-9001, or Daryl Schultz 206/644-7237 for more information, or write to the above address. Or, if you happen to be in town on the first Tuesday of the month, drop on by.

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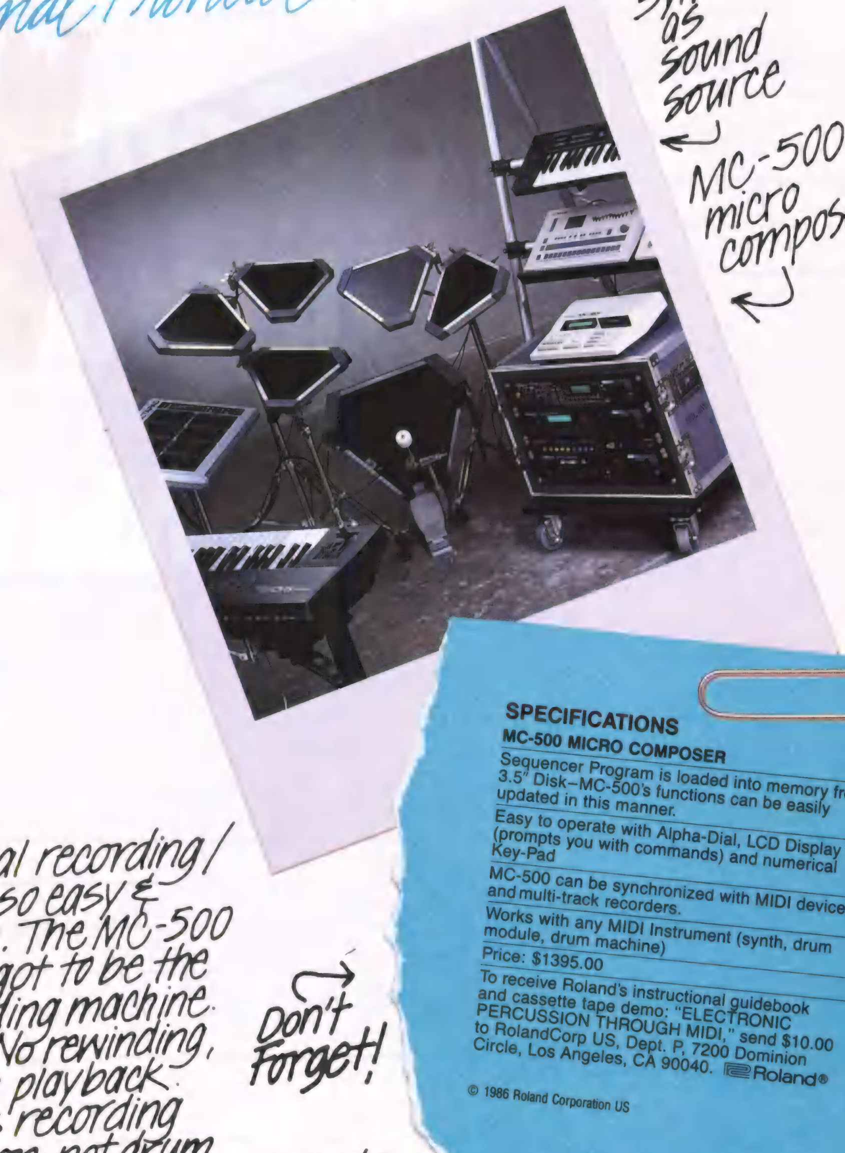

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▶**Xpander Users Group** is an informal forum for the exchange of patches, interface hardware and software, troubleshooting hints, and other useful information relating to the Oberheim Xpander. An irregularly published newsletter is planned. Contact Mike Metlay at:

Mys-Tech Productions
P.O. Box 81175
Pittsburgh, PA 15217

▶**The Digidesign BBS** provides technical support and user tips for registered owners of Digidesign software, as well as general news about the music biz, computers and music, etc. Sound Designer format sound files (for use with *Sound Designer* and *Burner*, Digidesign's EPROM programmer) are on-line for downloading, and users are encouraged to upload sounds. Parameter files for Digidesign's new Softsynth program will also be on file for up/downloading. The BBS is on line 24 hours a day, seven days a week, and supports 300 and 1200 Baud communications (auto selected by the BBS). Set your modem for eight bits, one stop bit, no parity. Tel. 415/494-0264.

—from page 14, R & R

2008-1-P). Greek emigrant John Yanni Christopher (isn't that where Vangelis is from?) now lives in Minneapolis (where Kottke is from). His first album, *Optimystique,* was released in 1984 (in a limited run of 3000 on Varese Sarabande) and became something of an underground classic, leading Peter Baumann to give him a shot with Private. Yanni's music is a cross between Eddie Jobson's Private release and Vanelis—highly orchestrated, pretty melodies on digital keyboards, using mainly shimmery LFO'd organ voices. Like Jobson, it was assembled from improvised, short segments, resulting in many changes within each "piece" and a lot of sonic variety. This is sophisticated electronic music. "Dad? Can I borrow the keys to the imagination?"

Eugene Electronic Music Collective, *Northwest Passages* (cassette). The Pacific Northwest is one of the more active regions on the EM map. This baker's dozen extends from Eugene, OR to Vancouver, BC geographically, DX7, to "voice" technologically, and noise experiments to sophisticated 8-track neo-classical compositionally. Good documentation tops it off. P.O. Box 3219, Eugene, OR 97403.

Scott Duncan, *"Clockdreams"* (cassette). Scott Duncan, on the other hand, is a different kettle of fish altogether. Playing mass synthesizers, guitar, bass, drum machine and sequencer, he creates highly melodic instrumental rock which varies tempo and texture frequently. Of particular note are the rich analog voices. Duncan writes that this tape isn't "officially" for sale, but I'll bet if you sent him $5-6 to cover costs he'd run one off. 3197 Phlox Drive, Palm Harbor, FL 33563.

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312/866-2532

Shure SM98 microphone mounted on drum rim with A98MK drum mount kit.

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Ed Charles holding the steel-to-MIDI interface

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▶A prototype steel guitar-to-MIDI interface, tentatively called the **Steelrider**, was unveiled at the International Pedal Steel Guitar Convention by Ed Charles (steel player with Gordon Lightfoot). It is expected to support either ten or 12 string steels, and mount between the bridge and normal guitar pickup. Projected price is around $1,800. For further information or suggestions write to:

Ed Charles
77 Mayfield Ave.
Waterloo
Canada N2J 3R9
(submitted by Gerry Simon, Kent, OH)

▶The **MC1 MIDI Guitar Controller** ($699), originally available as part of the IMG1 MIDI guitar system, is now available separately and is compatible with the Roland GR-guitar standard (Roland guitars, Steinberger GL-2T/GR, Hamer Phantom A7, M.V. Pedulla MVP-S guitar, etc.).

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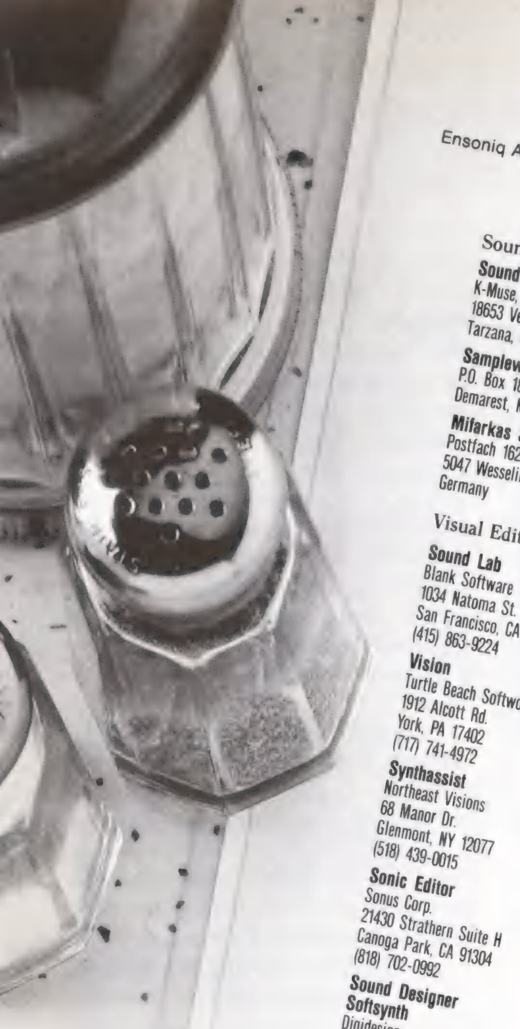

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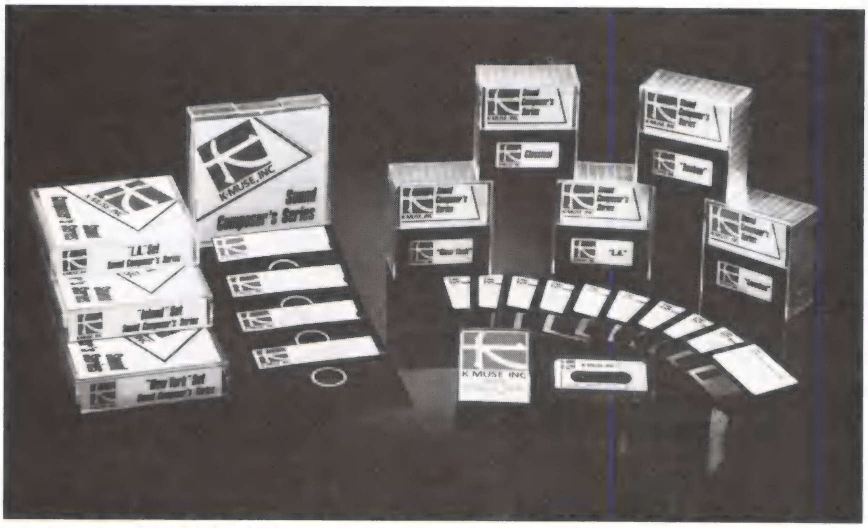

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▶**MIDI-Scope** ($50), a MIDI data analysis program for the Apple II computer family, features real time data capture, selectable 4- or 8-channel readouts, backward and forward buffer scanning, raw data viewport, printer dumps, and more. Versions are being readied for the C-64, IBM PC, Amiga, Atari ST, and Macintosh.

Brooke Boering
135 Stephen Rd.
Aptos, CA 95003
408/662-0422

SYNCHRONIZATION

▶**SMPTE time code software** is now available for licensing from Synchronous Technologies. Companies already licensing such software include Allen and Heath Brenell Ltd., who have incorporated several SMPL System time code features (time code reader/generator, MIDI song pointer, and punch in/punch out for selected machines) in CMPTE, their Commodore-64-based interface for the A&H CMC series of mixing consoles.

Synchronous Technologies
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Oklahoma City, OK 73116
405/842-0680

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▶**Midwest MIDI Consultants,** in addition to retail sales and marketing services, runs a public BBS for the exchange of information and data files concerning MIDI and MIDI products. The BBS operates 24 hours a day on an IBM PC running FIDO BBS software; call 405/733-3102 or access via FIDO-NET mail at node 147/6. MMC also provides, among other services, a File Archive Service for musicians or studios who want to store important back-up files off premises, yet have these accessible via modem.

MMC
P.O. Box 30995
MidWest City, OK 73140
405/736-6676

OTHER NEWS

▶As this issue of **EM** was going to press, we received news of a significant new product that will be distributed by Digidesign (Palo Alto, CA), the whizkidz who brought you Sound Designer software. Marketing Manager Susan Alvaro gave **EM** writer Larry Oppenheimer an exclusive sneak preview of **Le Box,** a passive sound sampling device. (As is now well-known, passive sampling takes an additive approach, which is both more complicated and less sophisticated than older, digital hoosiwahs.) Le Box requires only that the user place the open box near the sound source and wait until it fills with sound, then simply slam the soundproof lid and secure with the four vibrating techno-straps. Le Box features numerous dubious improvements over other passive samplers, notably: the Sound Quantity Meter (pat. rej.), which allows the user to avoid the problems of undersound or oversound (sound spill), the Soundvalve,™ which is cleverly designed to look like a common spigot, but in fact allows loud sounds (such as thermonuclear explosions or software crashes) to be regulated during release, or soft sounds to be easily captured by opening the valve and nonchalantly leaving the box near where small sounds are known to congregate—then quickly closing it when the little buggers wander in to check it out. (This may remind readers of last year's successful software development tool, the Bug Hotel.)

Le Box also features a complete MUBI (Musically Useless Box Interface) implementation. Constructed with more-or-less high-quality parts and a sturdy, corrugated cardboard chassis, Le Box is warranteed for life against anything except being left in the rain or the kitchen sink. Alvaro declined to reveal the actual manufacturer of the unit, stating that the firm was "afraid someone might find out who they are." Industry insiders may remember that Alvaro was also intimately involved (heh, heh) in the creation of the Garlic Mod, a panacea for electronic instrument problems, during her days at CAE Sound (San Mateo, CA; the Garlic Mod is still available from CAE). Le Box is planned for release on April 1, 1987 and will be available from Digidesign for $3.95 and two Sound Designer boxtops. (No photograph was desirable at press time.)

CALENDAR

▶Charles Brown Music, Inc. and **Future Access** offer intensive hands-on seminars which are an introduction to digital music and audio production on the NED Synclavier Digital Music System. Workshops are 9 a.m. to 6 p.m. on January 10 or January 24; $250 per person or $225 per person when two or more people from an organization register. For more information and registration contact Steven Medlay at:

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The Media Center
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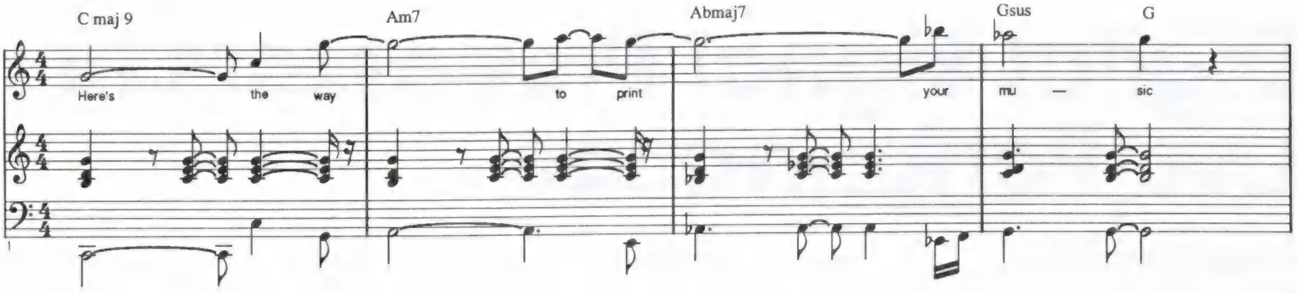
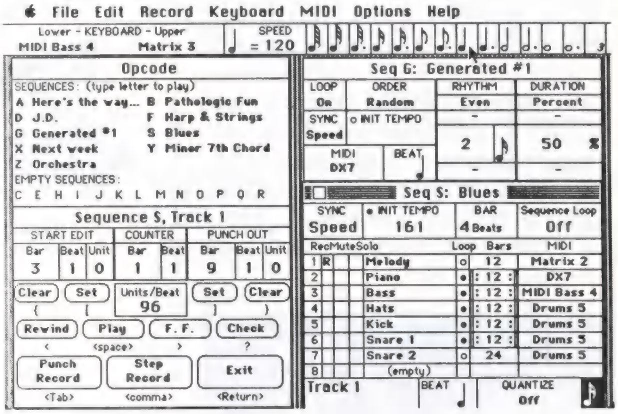


Sequencer 2.5 is the latest version of our Sequencer, which features music transcription. It won't gag if triplets and quintuplets and eighth notes are all in the same measure — but you can specify that you only want one kind of division. It understands the difference between 3/4 and 6/8 time and generates appropriate note durations without making flurries of tied sixty-fourth notes. **Sequencer 2.5** transcribes your music into files for Electronic Arts' *Deluxe Music Construction Set* or Mark of the Unicorn's *Professional Composer*. It also reads files created by either program. Both programs allow printing, entering, and editing music in standard music notation, including graphics and lyrics. *Deluxe Music Construction Set* is one of the best values in music printing and supports up to 16 tracks on 8 staves. It allows very flexible symbol placement and it can play through MIDI itself. **Sequencer 2.5** works with both the original version and the new version 2 which supports Adobe's new *Sonata* music notation font for Apple's LaserWriter. *Professional Composer* allows up to 40 staves, and has a vast library of musical symbols. It also has a number of automated capabilities including instrument range and rhythm checking.

Sequencer 2.5 also features MIDI Files. MIDI Files are a standardized way of storing MIDI sequence data, complete with velocity, pitch bend, precise timing information, and everything else, in a file which can be read or written by other programs. *M* and *Jam Factory* from Intelligent Music both use MIDI files. These files are fully documented so you can write your own composition or performance programs!

Sequencer 2.5 has all the other professional MIDI sequencer features, including: up to 26 chainable sequences with up to 16 loopable, mergeable tracks per sequence in each file; step entry; multichannel recording; innovative transpose capabilities and random-generated sequences; recording of tempo changes; MIDI Song Pointer for synchronization with SMPTE/MIDI interfaces.



Lower - KEYBOARD - Upper
MIDI Bass 4 Matrix 3
SPEED = 120

Opcode

SEQUENCES: (type letter to play)

A Here's the way... B Pathologic Fun
D J.D. F Harp & Strings
G Generated #1 S Blues
X Next week Y Miner 7th Chord
Z Orchestra

EMPTY SEQUENCES:
C E H I J K L M N O P Q R

Sequence S, Track 1

START EDIT			COUNTER		PUNCH OUT		
Bar	Beat	Unit	Bar	Beat	Bar	Beat	Unit
3	1	0	1	1	9	1	0

Units/Beat 96

{ [ ] }
< <space> > ?
<Tab> <comma> <Return>

Seq G: Generated #1

LOOP On
ORDER Random
RHYTHM Even
DURATION Percent
SYNC Speed
○ INIT TEMPO
2
50 %
MIDI DX7
BEAT

Seq S: Blues

SYNC Speed
● INIT TEMPO 161
BAR 4 Beats
Sequence Loop Off

	Rec	Mute	Solo		Loop	Bars	MIDI
1	R			Melody	○	12	Matrix 2
2				Piano	●	: 12 :	DX7
3				Bass	●	: 12 :	MIDI Bass 4
4				Hats	●	: 12 :	Drums 5
5				Kick	●	: 12 :	Drums 5
6				Snare 1	●	: 12 :	Drums 5
7				Snare 2	○	24	Drums 5
8				(empty)			

Track 1
BEAT
QUANTIZE Off

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The job of the sound mixer has always been important, but the new generation of MIDI-controlled signal processors has the potential to turn a sound mixer into literally another member of the band.

Digital Signal Processors in Live Performance

BY LARRY OPPENHEIMER

In the old days, using an Echoplex during a live performance was enough to crown you a king or queen of space. All those fancy sounds created in the studio through elaborate shennanigans were unavailable out in the "real" world of stages and audiences, and many of the Echoplexes around at that time were found onstage. Today's musical groups can choose from enough delays, reverbs, effects processors, and other digital goodies to choke a Successively Approximated Horse. This aural horn of plenty has long since spilled off the stage, and outboard processing has begun to stack up at house mixing consoles like so many bundles of firewood. Aside from simple enhancement, any sound can now be easily filtered, modulated, reverberated, and otherwise radically transformed to the point of nonrecognition. And MIDI, which can externally control these high-powered processors with gestural controllers in a high-level programmable fashion, allows some degree of improvisation. Has this black-box laden console area actually passed the point of sound reinforcement and crossed into a conceptual space closer to that of a musical instrument?

Larry Oppenheimer is a musician, sound engineer, electronics technician, and consultant, as well as a writer. His San Francisco-based company, Toys in the Attic, offers a variety of consulting services in the fields of MIDI, product documentation, and signal processing.

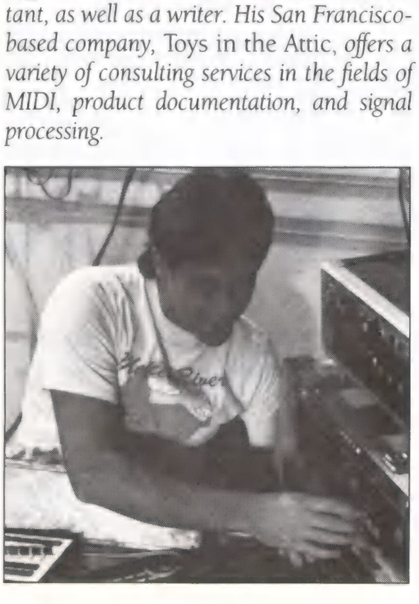


PHOTO: CATHERINE DUNFORD

I believe that this is so, and that a new generation of sound reinforcement engineers—thanks to technical savvy and musical sense—will transform the house mix engineer into another performing member of the band. This article covers some of my early experiments with this concept on a recent tour I did as sound engineer for the Stein/Walder Group. (For more information on the sound reinforcement used for this tour, see the December '86 issue of *Mix*.)

THE STEIN/WALDER GROUP

Ira Stein and Russel Walder, a piano and oboe duo, released *Elements*, their first

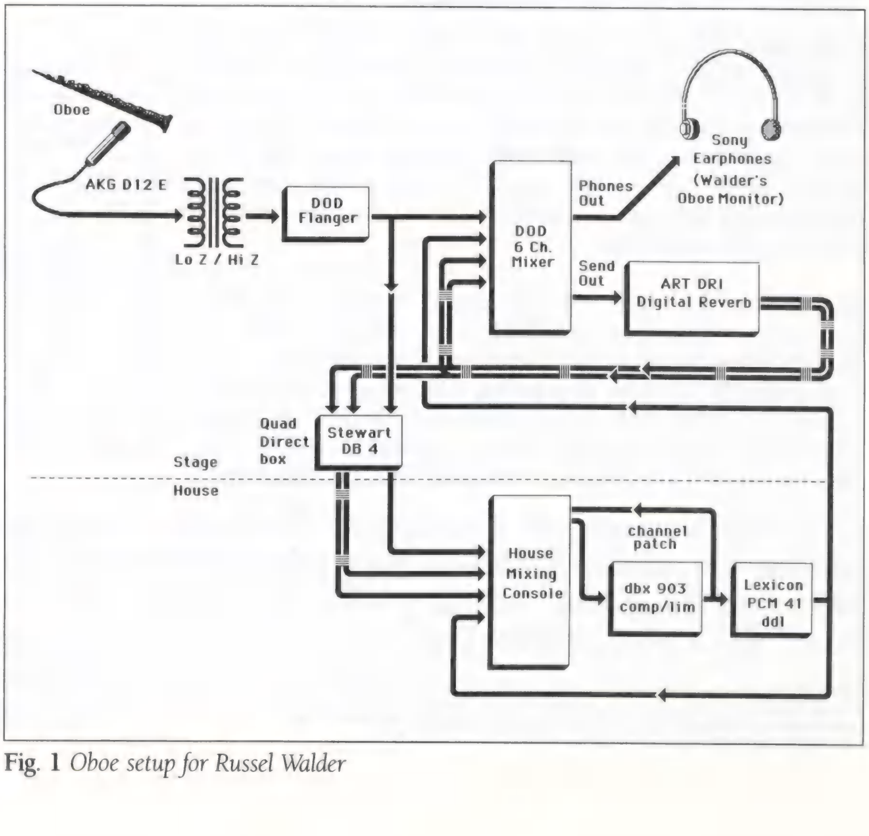


Fig. 1 *Oboe setup for Russel Walder*

Windham Hill record, in 1982. In the next four years, they began exploring the use of synthesizers and electronic percussion in their music. By the release of Stein/Walder's second record, *Transit* (March '86), they had taken on Kurt Wortman as percussionist and me as sound engineer and technical director. I have a strong interest in digital signal processing, and thus provided a number of "toys" from my studio to supplement their existing setup. Having been trained as a musician long before I gained any technical background, I began to learn the music in detail as I worked more shows with them. The sound of the group was growing and changing, and Stein and Walder granted me a great deal of freedom in devising and implementing effects to complement and enhance the overall sound. During the summer of '86, Stein, Walder, Jim Sagebiel (replacing Wortman, who was on tour with Jan Garbarek), and I toured the Eastern Seaboard as the Stein/Walder Group, giving me a chance to develop "parts" which I performed, and even to develop improvisational skills. During this experience, I realized that there is great potential in the combination of modern digital signal processing and MIDI in a sound reinforcement context.

INVENTORY

The Stein/Walder Group's instrumentation for this tour was: Stein—grand piano, Yamaha DX7, Sequential Prophet 600, Oberheim OB1 (w/J.L. Cooper MIDI-to-CV converter), and Sequential Drumtraks; Walder—oboe (see **Fig. 1**); Sagebiel—Simmons SDS7, and E-mu SP12 (driven from a Roland Octapad). The signal processors included two Lexicon PCM70 effects processors and two ART DR1 digital reverbs, an Eventide SP2016 signal processor, Yamaha SPX90 signal processor, Lexicon PCM41 digital delay, and DOD R910 digital delay line. Of these, the SPX90, DOD delay, and one of the DR1s were onstage, and the rest were at the house mixing station. The PCM70s and DR1 at the house mixing station were under the control of a Yamaha MCS2 MIDI Control Station. Typically, there were no more than two effects sends available on the mixing console, which forced me to do insert patching on several individual instruments when I wanted to put in specific effects.

MIDI CONTROL

In the past, using outboard gear in live performance required either static use (set it and forget it), or lots of leaning over to the rack to fiddle with knobs and push buttons. This was distracting to the general task of mixing, and did not allow for complex manipulations. Much of the signal processing used on this tour (PCM70, DR1, SPX90) was controllable in some fashion through MIDI, which made it possible to use multiple devices in a sophisticated and musical yet coherent fashion. However, I still found direct, non-MIDI control useful, particularly with the PCM41.

There are currently three basic kinds of MIDI control for signal processors: program changes (available on all MIDI-controlled processors), parameter dumping via System Exclusive codes (not available on any of the processors I used), and dynamic parameter control. It is the first and last that are of the most importance here. At the time of the tour, only the PCM70 allowed dynamic parameter control. (Since then, ART has released its Performance MIDI software which allows any two parameters of the DR1 to be controlled in real time via MIDI (see the December 1986 issue of **EM** for the review). Also, Eventide is releasing a MIDI update for the SP2016.) The PCM70 will link up to ten program parameters to any designated MIDI controllers. The DR1 and the PCM70 both allow you to arbitrarily map MIDI program change numbers to memory preset numbers. Presets therefore do not have to be stored in the order they are needed, thus saving a lot of memory juggling.

To control these effects I used the Yamaha MCS2, a small, lightweight box designed by Yamaha as an add-on for any MIDI controller that lacks the modulation and pitch wheels, foot pedals, and buttons available on most MIDI synthesizers. The MCS2 includes a spring-loaded pitch bend wheel, modulation wheel, two assignable sliders, three assignable buttons, eight program change buttons, a mode control button, and a five-character LCD. The rear panel accepts two each assignable footswitches and footpedals, and breath controller; there are also two MIDI In jacks whose data is merged with the MCS2's MIDI data, and, of course, a MIDI Out jack to send all this stuff to your MIDI gear.

Onstage, the DOD delay was not programmable and was, therefore, left on one setting all the time. The SPX90 was operated manually, without MIDI control; the DR1 presets (used by Walder onstage for his oboe) were changed via MIDI with prerecorded program changes from Stein's MSQ700 sequencer.

"Walder has been seeking a sound that is 'bigger' than that of the plain oboe, and we have spent a great deal of effort trying to find the right combination of processing to reach that goal"

APPLICATIONS IN THE STEIN/WALDER SHOWS

Whenever possible, I mixed the Stein/Walder Group in stereo. As most of the halls on the tour were less than 1000 seats, this generally worked out well and let me create more of a space around the audience. Only two processing devices had fixed applications in the Stein/Walder setup: the DOD delay unit, which added a stereo chorus effect to the Prophet 600, and the SPX90, which served as the primary drum reverb. The other processors were more loosely dedicated to particular instruments, but their function would change between enhancement and effects over the course of the show. The PCM41 was placed in series with the send to Walder's DR1, and acted as a very long, recirculating predelay. Walder has been seeking a sound that is "bigger" than that of the plain oboe, and we have spent a great deal of effort trying to find the right combination of processing to reach that goal. The long (400 to 700 ms) delay with a moderate amount of feedback, fed into a large concert hall reverb with relatively low diffusion on the DR1, produces a spacious, billowy sound. The delay time and modulation were often hand-tweaked to make the effect greater or weaker, straighter or more bizarre. In some cases, I got quite twisted with this, as when I used heavy envelope-controlled modulation with a great deal of recirculation. This creates an effect where each repeat of a decaying note has a greater delay time, and thus, a falling pitch.

> **"Has this black-box laden console area actually passed the point of sound reinforcement and crossed into a conceptual space closer to that of a musical instrument?"**

The second DR1 was a "utility" unit that served different purposes throughout the tour (although it was used much more as a reverb than an effects device). It was often used as an additional drum reverb, to add a splash of color or emphasize a statement, but on at least one occasion when the SP2016 was absent, the DR1 was used for house reverb. Without the real time parameter control that is now available, I was forced to deal with pushing buttons to change values—awkward, but useable.

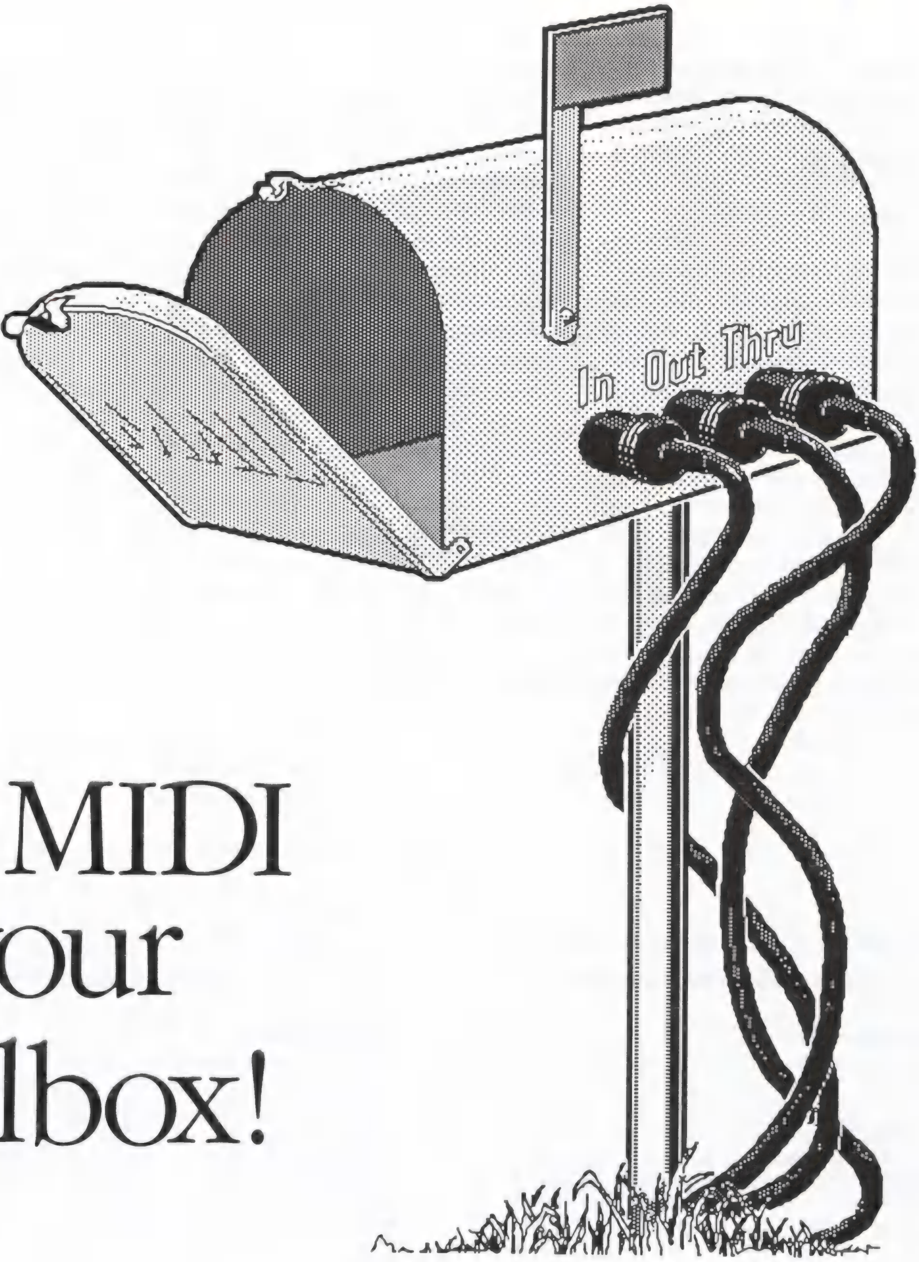
For most of the show, the SP2016 was the "house reverb" and used primarily for the grand piano and Prophet 600 (set mostly for string and organ sounds); at times, though, it served as an effects device for the oboe. Used as reverb, I typically would create short, medium, and long presets of the Stereo Room program, and a long preset of the Hi-Density Plate. Over the course of a song, I would tweak the reverb; this often involved changing the decay time to reflect the density or intensity of the music at a given point (e.g. increase decay time when there is a transition from an ensemble to a solo piano passage). In at least one case, the reverb was used as an effect: on the oboe /piano duet, "Marseille," the Stereo Room reverb was set to an absurdly long decay time (over nine seconds) to catch a climactic, ringing piano arpeggiation. Most room reverb programs have audible resonances because small room acoustics tend towards a lot of coloration; therefore, you might expect that asking the SP2016 to produce room reverb with a very long decay time, particularly at high frequencies, is an invitation to a metallic ringing in the reverb. But in this situation, the bold, sustained piano chords shimmered with harmonic activity. When Stein returned to the melody, I would pull back on the reverb time (and mix) to complement that change.

The SP2016 also played an important role as an effects device for the oboe. In the beginning of "Gratitude," Walder removes the reed from the oboe and plays the reed itself into the microphone, which yields an eerie sound much like a human cry or voice. After experimenting with the Multitap Delay program, I finally settled on the Moving Reverb program (from First Order Effects, a company producing custom software for the SP2016) to make the reed sound "awesome." Moving Reverb is a spacious reverb with long echoes that make the source appear to pan. In this case, I set the pan to go from center to the outsides. I also used envelope modulation on the PCM41. The Multitap Delay program, as well as Time Scramble (another wonderfully demented effect), did find use in an improvisational oboe/effects duet which Walder and I performed at several shows.

It was with the PCM70s, though, that I had perhaps the most fun (see sidebar). One of the PCM70s was dedicated mostly to providing rhythmic delays to sequenced ostinato patterns played on the DX7. Either the Chorus and Echo program or the Multiband Delay program would be set up as an unmodulated, multitap delay line. The delay times were programmed in advance (using the BPM presets of the PCM70, which relate delays to Beats-Per-Minute) to have specific rhythmic values that related to the sequencer tempo, known as synchro-sonic techniques. Typically, I would set up eighth, dotted eighth, and quarter note delays, with varying amounts of positive or negative feedback on each. The levels of these delays were linked to the modulation wheel on the MCS2, with careful positive or negative scaling. In this way, I could change the relative balance of the delays through a predefined range, thus varying the rhythm of the ostinato itself at will. One of the continuous sliders would be similarly linked to the delays' recirculation, so that I could also manipulate the number of repeats, producing even more complex rhythmic variations. The other slider, if used for this PCM70, was assigned to one other function which varied with the song: independent level control of another delay tap, high or low cutoffs for the band filters, or panning of the delays. **Fig. 2** shows one example, the setup used on the DX7 ostinato for "Gratitude." By working between the MCS2 and the effects returns on the console, I could vary the noticeability of the effect from barely present to mind-bending.

The other PCM70 was a "floating" effects unit, and was available for anything I cared to throw an effect onto spontaneously. One experiment I tried was to control room size in a reverb program with a data slider or mod wheel. Varying the room size control on digital reverbs generally makes such profound changes in the program that the output must be muted to prevent very ugly glitching. This is also true of the PCM70, yet I really wanted to simulate a change between a more warm, intimate ambience and a huge, spacey one. So, I very judiciously linked a number of strategic parameters of the Long Hall preset (high frequency and low frequency decay times, high frequency cutoff, diffusion, predelay) with careful scaling to the wheel or slider. When successful, it created a feeling of the room "breathing" with the music.

Another interesting effect combined the rhythmic delay approach with the PCM70's Resonant Chords feature. Bass lines in the group were generally covered by the Oberheim OB1, a monophonic, analog synthesizer. The OB1 sounded fine on their record, but did not cut through well live—especially in one song, where the bass consists of a rhythmically



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simple ostinato going from E to G to A. I set the Resonant Chords program at the song's tempo, then created rhythmic resonances that were harmonically related to the bass' activity: G4 (eighth note), A6 (eighth note), E1 and E2 (both dotted eighth note), and B3 (quarter note). The input signal's energy content determines if and when each resonance is excited. The mod wheel controlled the level (hence, balance) of the E2, B3, and G4 delays, while one of the sliders controlled both the resonance and level of the A6 delay. The other slider controlled the feedback on the low E. One of the programmable buttons was assigned to the pitch of the A6 delay, and scaled so that pressing the button raised the pitch to B6 (the fifth of the key), and releasing it lowered the pitch back to A. With this effect, I not only added rhythmic interest to the bass, but harmonic interest. The effect was brought in and out and altered throughout the tune as the structure of the piece demanded.

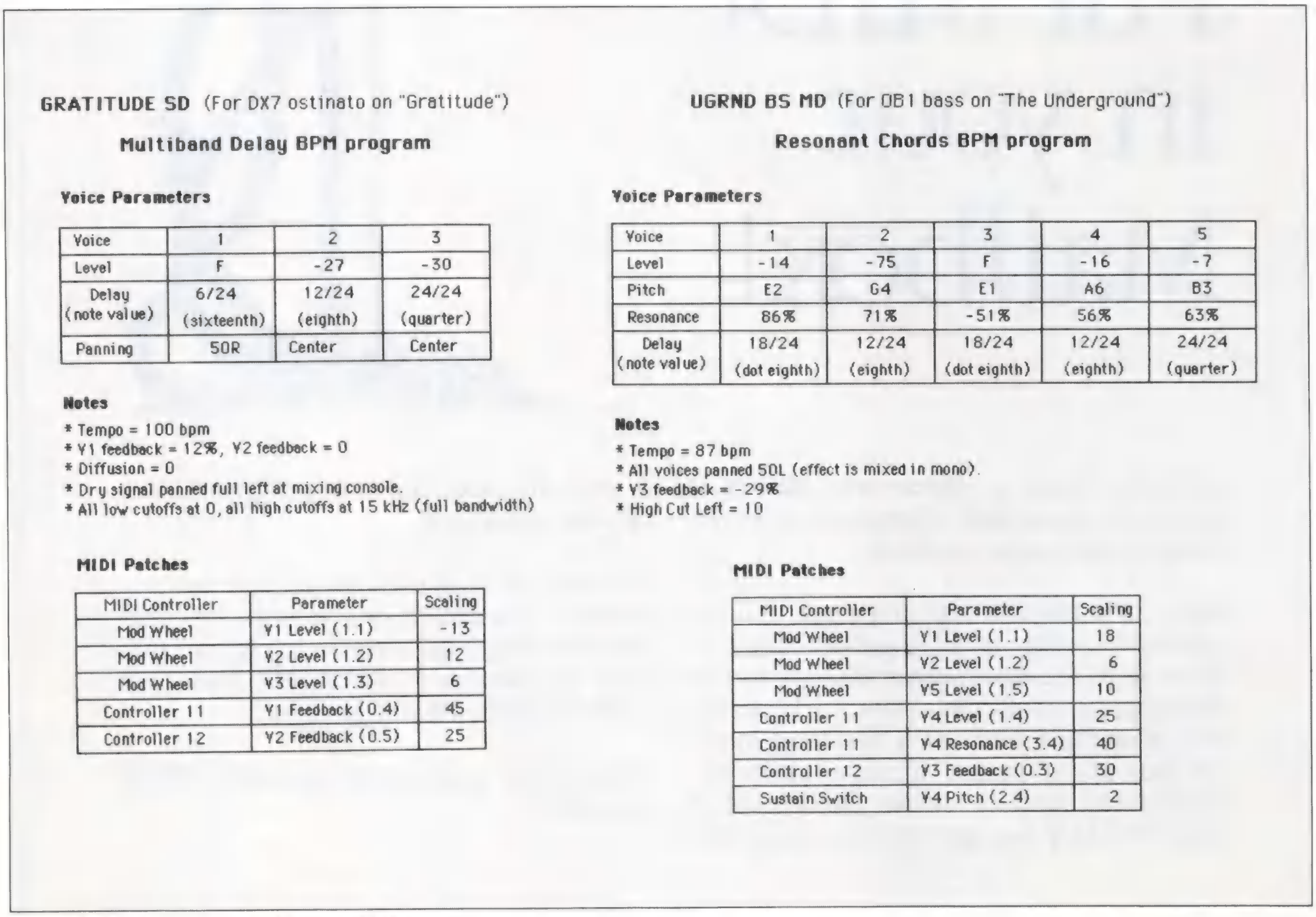
Basic presets for the PCM70s and DR1s were worked out for most of the material before the tour began, and presets were mapped to MIDI program change numbers so that eight songs were accessed by the eight program change buttons, with different versions of the same presets (or other presets) on other banks. Thus, one bank would have stereo effects, and another might have the same effects in mono for use when we did not have a stereo house system. The ease of remapping meant that I could create an improved preset only minutes before a show, and call it in place of the older version during the show, without changing my program change number for the song. With the Bank Assign mode of the MCS2, I merely had to press one button between songs to call up all new effects on the three units. (However, the SP2016 programs still had to be called from its front panel.)

TIPS AND OBSERVATIONS

I have only begun to scratch the surface of what can be done with a setup like this, but I do have some general and specific observations about the nature of this technique. On the more practical side, I found that it was generally easier to use the MCS2 than front panel controls as a gestural controller. The exception to this was the PCM41, which, like a trusty minimoog, still offers some nice features not available on other units and feels good to tweak by hand. Since the presets evolved as I went along, and I did not have hundreds of shows in which I could assimilate every detail, it became vital to use at least vaguely consistent functional assignments for the MCS2's controllers (e.g. mod wheel for balances, one slider for feedback, etc.). On the other hand, being too strict about making these kinds of "rules" defeats a good deal of the power that lies in these devices' flexibility. Therefore, I would usually leave at least one slider for a parameter control that could change identity from tune to tune. I used MIDI continuous controller numbers 11 and 12 for the sliders merely because they did not have any existing "standard" assignment (as breath controller does).

Programming the effects on the PCM-

—page 30



GRATITUDE SD (For DX7 ostinato on "Gratitude")

Multiband Delay BPM program

Voice Parameters

Voice	1	2	3
Level	F	-27	-30
Delay (note value)	6/24 (sixteenth)	12/24 (eighth)	24/24 (quarter)
Panning	50R	Center	Center

Notes

- * Tempo = 100 bpm
- * V1 feedback = 12%, V2 feedback = 0
- * Diffusion = 0
- * Dry signal panned full left at mixing console.
- * All low cutoffs at 0, all high cutoffs at 15 kHz (full bandwidth)

MIDI Patches

MIDI Controller	Parameter	Scaling
Mod Wheel	V1 Level (1.1)	-13
Mod Wheel	V2 Level (1.2)	12
Mod Wheel	V3 Level (1.3)	6
Controller 11	V1 Feedback (0.4)	45
Controller 12	V2 Feedback (0.5)	25

UGRND BS MD (For OB1 bass on "The Underground")

Resonant Chords BPM program

Voice Parameters

Voice	1	2	3	4	5
Level	-14	-75	F	-16	-7
Pitch	E2	G4	E1	A6	B3
Resonance	86%	71%	-51%	56%	63%
Delay (note value)	18/24 (dot eighth)	12/24 (eighth)	18/24 (dot eighth)	12/24 (eighth)	24/24 (quarter)

Notes

- * Tempo = 87 bpm
- * All voices panned 50L (effect is mixed in mono).
- * V3 feedback = -29%
- * High Cut Left = 10

MIDI Patches

MIDI Controller	Parameter	Scaling
Mod Wheel	V1 Level (1.1)	18
Mod Wheel	V2 Level (1.2)	6
Mod Wheel	V5 Level (1.5)	10
Controller 11	V4 Level (1.4)	25
Controller 11	V4 Resonance (3.4)	40
Controller 12	V3 Feedback (0.3)	30
Sustain Switch	V4 Pitch (2.4)	2

Fig. 2 *PCM-70 set-ups for the Stein/Walder Group.*

What's a PCM70?

While many people think of the PCM-70 as a digital reverb, it is perhaps more accurate to think of this device as a *digital effects generator,* with reverb being just one of many available effects. Like many digital signal processors, the PCM70 accepts program change messages (which can be "mapped"), but there's more. Up to ten different sound parameters can be placed under MIDI control, which has two main implications. First, one or more effect parameters can track your playing so that, for example, as you hit the keys harder the reverb time increases, decreases, or whatever. Second, you can literally "play" the PCM70 from a keyboard or other MIDI controller, or record changes in a sequencer track so that the effect given by the PCM70 varies automatically during the course of a composition.

There are three main operating modes. *Program* lets you select programs, *Parameter* is for editing a program (just like a programmable synthesizer), and *Register* mode lets you store and name custom sounds in one of the 50 user memory registers. There are over 40 factory programs, stored as a matrix formed by rows and columns. Rows contain related effects (i.e. plate row, chorus and echo row, hall row, etc.) while the ten columns select individual programs within each row. Different rows offer different adjustable parameters. Here is a description of the type of effect found in each row:

Chorus and Echo. There are six different delay taps, each of which can be individually adjusted for delay, feedback, level, and panning. Sine or triangle modulation can also be engaged for the various taps. This is the equivalent of having six different single-tap delay lines, which yields very rich chorusing effects.

Multiband Delays. Each tap can be individually processed for level, delay time, filtering (both high and low frequency), and panning. Two of the taps have independent feedback, and a master diffusion parameter sets diffusion for all six taps.

Resonant Chords is quite unusual. I'm sure you've noticed how flangers with highly resonant settings can impart tonality to a sound; imagine being able to do this with six flangers, each with adjustable level, pitch, degree of resonance, pre-delay, and pan, and you have a fairly good idea of what's happening here.

Concert Hall. This provides your basic concert hall reverb and includes a multitude of available parameters. *Rich Chamber* and *Rich Plate* are similar but use different reverb algorithms.

Infinite Reverb offers most of the same parameters as the rich chamber programs, except that a reverb time parameter replaces the gate parameter. Selecting infinite reverb stores and repeats whatever is in memory; any further audio input is locked out so that you can play over the sustaining sound.

MIDI Effects Programs uses existing programs from the other rows but ties specific parameters into specific MIDI controllers. For example, the MIDI Concert Hall program lets you adjust reverb time and mix from the modulation wheel, while aftertouch controls chorusing. A final row, *Control,* does not create sounds but rather lets you adjust MIDI and control parameters. By the way, several of the programs include a synchro-sonic BPM function where, upon entering a tempo in BPM, any delays will be synchronized to that tempo.

While you'll need to constantly refer to the manual's printed list of approximately 70 (yes, 70!) parameters in order to rapidly find the ones you want to alter, changing parameters is easy (thanks to a logical software) and lots of fun. In fact, it's very educational to observe how changing the diffusion, or high frequency content, or crossover, or any one of a number of functions changes the sound. Even if you don't plan on purchasing a PCM70, it's worth sitting down with one for an afternoon so that if nothing else you can understand how changing digital reverb parameters affects the final sound. This is knowledge that will come in handy when working with, or trying to understand, any digital reverb. Oh yes, and I should mention that there are some master parameters in the sense that adjusting these alters all related parameters for a given program.

MIDI-wise, the PCM70 responds to pitch bender, aftertouch, last note played, velocity, controllers 0 through 31 (the display shows the names of controllers that have de facto controller assignments rather than their numbers), and switches 64 through 95. Once you've selected the desired controller, select the parameter to be controlled and scale it for the appropriate response. You can control up to ten parameters per program, and control multiple parameters from a single MIDI controller. Although some parameters don't lend themselves as well to MIDI control as others, there's enough to keep you occupied. And of course, when you do come up with a patch you like, it can be saved in one of the 50 user registers.

Although some could argue that a top-of-the-line dedicated reverb might offer a slightly better reverb sound, a dedicated reverb gives you drastically fewer overall options. And we're talking *options*; Lexicon really did their MIDI homework and the MIDI implementation is on a par with that of the best MIDI synthesizers. The price of $2295 may seem expensive—but only if you haven't had the opportunity to sit down with this device and experience its versatility.

—Craig Anderton

70s was as laborious as any other phase of music composition. Before going on the road, I spent many hours listening to parts and tweaking effects that seemed like they might work; these were then refined by the experience of each show. Two factors were vitally important. The first was the choice of parameters; some parameters responded well to MIDI control, and others produced artifacts (nasty noises). This was affected strongly by the second factor, which was the scaling.

Yamaha MCS2 Control Station

Yamaha's MCS2 MIDI Control Station is an extremely compact (13-3/4 × 2-1/8 × 7-15/16 inches), lightweight (under 3 lbs.), and powerful accessory for functional control of MIDI instruments and networks. It provides controllers and ancillary functions for MIDI instruments that lack extensive control facilities, but the applications for this little box go far beyond this basic function.

Only three MCS2 controllers—spring-loaded pitch bend wheel, modulation wheel, and breath controller jack—have fixed functions. These are transmitted over MIDI as pitch wheel, controller 1, and controller 2, respectively). The wheels are of the miniature type found on smaller Yamaha keyboards (e.g. DX100), and the pitch bend wheel transmits only seven bits of data (as is generally the case) so quantization of pitch bends may be audible. In addition to the wheels and breath controller jack, there are two sliders, three buttons, and four rear panel jacks (two each footswitch and footpedal) which are assignable to any appropriate MIDI control change code (i.e. switches should be assigned to a switch code, sliders and pedals to continuous controller codes). I doubt that it would be very difficult to plug other controllers (joystick or ribbon controller, perhaps?) into the footpedal jacks, which could open up yet more avenues. There are also eight buttons dedicated to entering program changes.

The rear panel includes two MIDI In jacks, which accept information from other instruments and merge it with data generated by the MCS2. The result appears at the MIDI Out jack. There is no MIDI Thru, since the MIDI Ins effectively perform that function. To avoid possible confusion from multiple timing sources, MIDI In 2 accepts only channel messages; all system messages are filtered out. Controller assignments and current status information are shown on a five-character, backlit LCD.

Those are the basics—but not the whole story. Besides sending controller information, the MCS2 includes a host of other convenience features. As you might expect, there are controller default assignments on initial power-up (which can be restored at any time), but Yamaha has also compiled a set of useful "preset" assignments. These presets are listed on the unit's front panel and may be assigned to any of the controllers. Many of these are simply common controller selections (Data Entry, Sustain Switch, etc.), but others are status and mode functions (Local Control On/Off, Omni On/Off, Poly/Mono, Start/Stop/Continue, Tune Request, Reset). The presets don't stop there, though; they just get less standard. There's program increment/decrement for single value program changes, channel increment /decrement (from buttons or slider /footpedal) for changing the MCS2's channel assignment on the fly, and even a tempo control option that sends Timing Clock messages at a rate determined by the slider or pedal position. (Of course, these last two are not control changes.) It is important to realize that these presets are merely options which you may or may not choose to employ.

It's easy to assign controllers to MIDI codes; simply push the Assign button and use the two sliders to match the controller to the desired assignment in the display. These assignments are retained when the unit is powered down. Program changes are set up using the bank/register system (eight banks of eight registers) and can be selected in three ways: enter the bank and register numbers on the program change buttons; select the bank and press the Bank Hold button, which then allows the program change buttons to select registers within one bank; or assign the program increment or decrement presets to the assignable buttons. It would be nice if the controllers could be assigned to different channels, but, alas, all of the MCS2's data is transmitted over one channel. In my situation, this has not yet been a problem, and in the larger scheme of things, this is a minor complaint. The manual is well written (in three languages!), provides all necessary information, and includes some useful appendices concerning MIDI.

There are clearly many, many uses for this little wonderbox besides adding pitch bend to your electronic piano: used in conjuction with a sequencer, control changes can be recorded or added on playback, and performances can be controlled with the start/stop and tempo features; footpedal and footswitch control can be added to an onstage MIDI system used by a guitarist, remote keyboardist, percussionist, etc.; even signal processors can now be easily controlled with MIDI. The newness of this kind of application, combined with the incredible power and many choices offered by the processors, has kept me from exploring some of the more exotic uses of the MCS2. But I feel that in the end, the MCS2 will be such an important part of what I do, both as a sound engineer and as a musician/composer, that I will consider it a primary expressive tool, i.e., an instrument. At $325, the Yamaha MCS2 is an excellent bargain; do not overlook it.

—*Larry Oppenheimer*

Product Summary

Product: Yamaha MCS2
Type: MIDI Control Station with multiple assignable controllers
Available controllers: Pitch bend wheel, modulation wheel, breath controller jack, two sliders, three buttons, and four rear panel jacks (two each footswitch and footpedal)
MIDI ports: Two MIDI In (with merge function); MIDI Out
Display: Five-character, backlit LCD.
List Price: $325
Manufacturer: Yamaha, 6600 Orangethorpe Ave., Buena Park, CA 90620; tel. 714/522-9011

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The PCM70 not only allows a parameter to be controlled, but it allows the effect of the incoming control to be scaled in strength. Proper scaling gave me a sufficiently wide range of variance in the controlled parameter(s) while offering reasonable resolution, and did not interact with other parameters under control to produce artifacts. In some cases, the proper scaling was pretty easy to find; in others, such as the room size simulation, finding the proper settings took a whole lot of trial-and-error. Mapping program changes was another crucial and time-consuming step. Preset names had to be systematic enough that I could confirm at a glance what program was running. Typically, I used the name of the song and/or the instrument name that it was processing, plus an "M" or "S" for mono or stereo, and a "D" if it was a version with MIDI control implemented. Unfortunately, at the time there were no librarian or voicing programs for any of these processors, so I could not offload my presets for backup or build presets without dealing with the PCM70's matrix parameter system.

With such a large amount of outboard gear (most of it with unbalanced outputs) and a different sound system in each town, grounding became a serious issue. The ideal would be to transformer isolate every output, but this was too expensive to do for this tour. So, I satisfied myself with electrically isolating every unit from the rack and the other units, and plugging them into a common AC strip. To protect my equipment from who-knows-what power line gremlins, the AC strip was a Triplett surge, spike, and noise protection device, with individually-filtered outlets. To make the MCS2 handy enough for constant manipulation, it sat right on top of the console.

More valuable to me than these specifics, though, were some of the general observations I made. First, many processor characteristics that are easily noticed in the clinical confines of the recording studio are not even detectable in live performance situations. This is a double-edged sword: subtle gestures are lost, but so are some of the glitches and garbage. When creating effects in a dense mix in a decent-sized house, broad strokes are necessary to make the point. Reverb decay times (which, for me, varied from three to ten seconds) and recirculation levels were two parameters in particular that would sound great in a given preset live, but back home in the studio sounded drastically overdone. Similarly, mix levels had to be quite high to achieve the desired effect, and panning on stereo effects was generally best when extreme. On the plus side, though, a lot of digital noise and artifacts were not too audible in the live situation. Even the muting that occurs on most processors when switching presets was often unnoticed by the audience when changes were strategically placed in the music.

It was very important to consider the natural acoustics of the hall when creating digital reverb presets. In most cases, halls provide plenty of low frequency reverb (and often too much), but the air absorbs high frequencies. So, my reverb presets tended to have very short LF (low frequency) decay times and long HF (high frequency) decay times. Similarly, halls typically have plenty of early reflections, so I tended to use none in my reverb presets, and to set the predelay to at least 50 ms or so to allow the natural reverb to build up before the digital reverb "kicked in."

In The Future

I hope to update our DR1s so that they may also be driven from the MCS2. Additionally, I plan to try out the PCM70 librarian/editor software program now available from Dr. T's Software. On this tour, I did not have any footpedals or footswitches to use with the MCS2, and I anticipate that adding them would give me still better control of my toys. I experienced some problems with the amount of change that I wanted to perform on assignments of instruments to processors. In the future I hope to add a MIDI-controlled audio patch bay, such as that made by Ibanez, to allow me to program several configurations of effects send buses and individual instruments to the various processors. I intend to continue to refine my concept of high-level control of sound modification so that it will become as much a part of my job as a sound engineer as adjusting levels or equalization. On this tour, I often found myself working with one hand on the console and the other on the MCS2; I would like to extend this thinking until the processors can be used as real time tools just as easily as the console. The ultimate goal, though, is to make my modification of sounds increasingly integral to the music itself and the audience's perception of the piece.

MIDI is changing the face of signal processing setups; here are the basics to get you started in this new field.

MIDI Controlled Effects Devices

BY ALEX VANGELLOW

There will always be some players who turn on an effect and leave it set the same way throughout a piece. But MIDI control can bring new forms of sound processing within reach of the performer—without an auxiliary engineer or tech. However, there must be a couple hundred signal processors on the market right now that claim to be MIDI controlled or MIDI compatible, with more being introduced every day...so how do you choose one for your personal MIDI setup?

Everything that "has MIDI" doesn't have the same implementation; and every player's setup will require different effects to fit his or her creative environment. Luckily, there are some basic guidelines that will render the decision-making process a little easier. For starters, there are currently three main types of MIDI-controlled audio processing devices—digital delay-type products, digital reverberation units, and combinations of both (and sometimes more) in one device.

BASIC MIDI CONTROL FOR PROCESSORS

The original intention of putting a MIDI port on effect devices was to enable changing an effect setting and synth patch simultaneously. With the most basic form of MIDI control, a device will have preset reverb or delay settings for each program that can be accessed via MIDI—i.e. selecting synthesizer patch 1 always gives program 1 in the effect unit, selecting synth patch 2 gives effect program 2, and so on (see **Fig. 1**). With basic MIDI units there will also be no provisions for editing or modifying the programs, and no way to change the program numbers to which various effects are assigned. For a MIDI studio setup, this poses no problem because a sequencer can tell the effect to change to the appropriate program via its own MIDI channel at the appropriate time. In a live setup, however, this simple, limited kind of implementation may be a disadvantage—you would need to juggle synth program numbers until they matched the desired effects program numbers. And if you want to use the same effect on two patches, well, that's just too bad. Another problem is that the effects device may accept more program changes than a synth can transmit, thus rendering many of the effects programs inaccessible.

> **"Everything that 'has MIDI' doesn't have the same implementation"**

PROGRAMMABLE EFFECTS PROCESSORS

The programmable effect processor is the next step in this evolution. It may have factory preset effects or suggested settings

Alex Vangellow owns Northern Music & Video, a full-line music store in Potsdam, NY. He studied at the Eastman School of Music in Rochester, and holds a degree in Mechanical Engineering from Clarkson University in Potsdam. He is a clinician/consultant for Lexicon, and is a professional singer/songwriter and keyboardist with the band Double Axel.

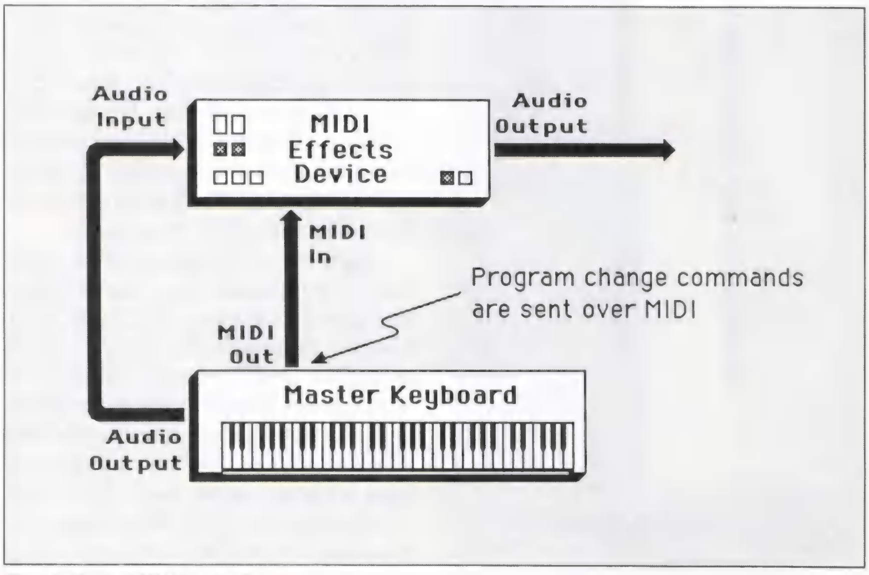

Fig. 1 *Basic MIDI control set-up*

that may be edited, then stored in the desired program location. The Yamaha SPX 90 (as well as many others I'm sure) has a MIDI control section that allows any of its program numbers to be called up from any corresponding synth program change; for example, program 1 can be called from synth program 5 or 25 or even from both. This correspondence, often called *mapping*, lets the programmer get the most out of a synthesizer/effects combination because their program numbers can be tailored to each other. This kind of MIDI control lets us change sounds quickly and easily in a studio situation without having to designate a MIDI channel specifically to the effects. Of course, if you care to, you can "overdub" the effect program changes on a separate channel of the sequencer, thus leaving you free to concentrate on other aspects of the mix.

We are now seeing some designers take this kind of MIDI control a little more seriously. Ibanez has a MIDI effects patch bay that lets MIDI patch changes switch effect loops on and off for two different inputs, thus letting us use the same effect on more than one source. The SPX 90 and Korg DVP-1 let a MIDI keyboard controller designate relative harmony notes for their harmonizer sections. (In one of its modes, the DVP-1 is a MIDI vocoder that uses its internal waveforms to vocode the speech input; these waveforms respond to note input from a MIDI keyboard.) On the SPX 90 we can set the gate attack and release times under MIDI control, or use a MIDI keyboard controller to determine playback pitches of its sampler section. Some of the multi-effect units give us so many different types of effects that it would be very difficult to access them all without MIDI control.

"Now the effect device can truly become an integral part of the performance—the artist no longer needs to rely on telepathy with an engineer"

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But these units are only scratching the surface of MIDI's capabilities. For some players, just calling up a delay program for their synth patch may not be enough (when a year ago or so that's all we could do!). Currently the most flexible MIDI device is Lexicon's PCM70 processor. It has delay effect and reverb programs, as well as resonant chord programs made famous by their 224X processor.

Each PCM70 program has a multitude of parameters that can be edited and stored to suit a specific application. Lexicon designates the factory patches as *programs* and the user-modified patches as *registers*. The programs and registers are assignable to any corresponding MIDI program change. But let's say that you have a certain synth patch that sometimes needs just a little delay, and sometimes lots, depending on the tune. Using what Lexicon calls dynamic MIDI control, the PCM70 will let you change any of the parameters of your delay program using any available MIDI controller. So, you could assign, say, your synth's data entry slider to vary the wet/dry mix from no effect at the bottom to 100 percent wet at the top. If your mood dictates a lot of delay, you can move the slider up. If you care to change the delay time of any or all of six available discrete delays, you can assign the modulation wheel of the synth to increase the delay time while the aftertouch might increase the feedback level (number of repeats). All of a sudden your simple solo sound has come alive through MIDI control of not only synthesizers, but also of the associated delay effects using the same elements of performance control (mod wheels, pedals, etc.) to which you are accustomed. Of course, Lexicon is not alone in using MIDI for increased expressiveness; ART recently retrofitted their DR-1 to allow for MIDI control of selected parameters, and surely more such units are on the way.

Now the effect device can truly become an integral part of the performance—the artist no longer needs to rely on telepathy with an engineer. And think of the possibilities in the studio! If there is any kind of timing track available, we could sync a sequencer and "overdub" keyboard controller changes for the effect device, including not only program changes, but level changes, reverb, or delay time changes, mix levels, and even changes in panning of individual delays for certain passages. The whole effects mixing process could be automated, leaving hands free for other important real time duties.

Or even consider a live sound reinforcement system that could keep a small MIDI control device around to supplement the mixer controls, and make remote changes or programs or parameters during performances. And I'm sure that with all of the MIDI guitar synthesizer interfaces available, there is plenty of room for expression from the fretboard as well.

There are many differences between the effect devices that are available today, and the ones mentioned above are but a bucketful from the ocean. But before you decide to settle for the unit that serves your purposes for today, take the time to look ahead to your future needs. . . the best effects device might be one that opens up possibilities of which you haven't even dreamed yet. **EM**

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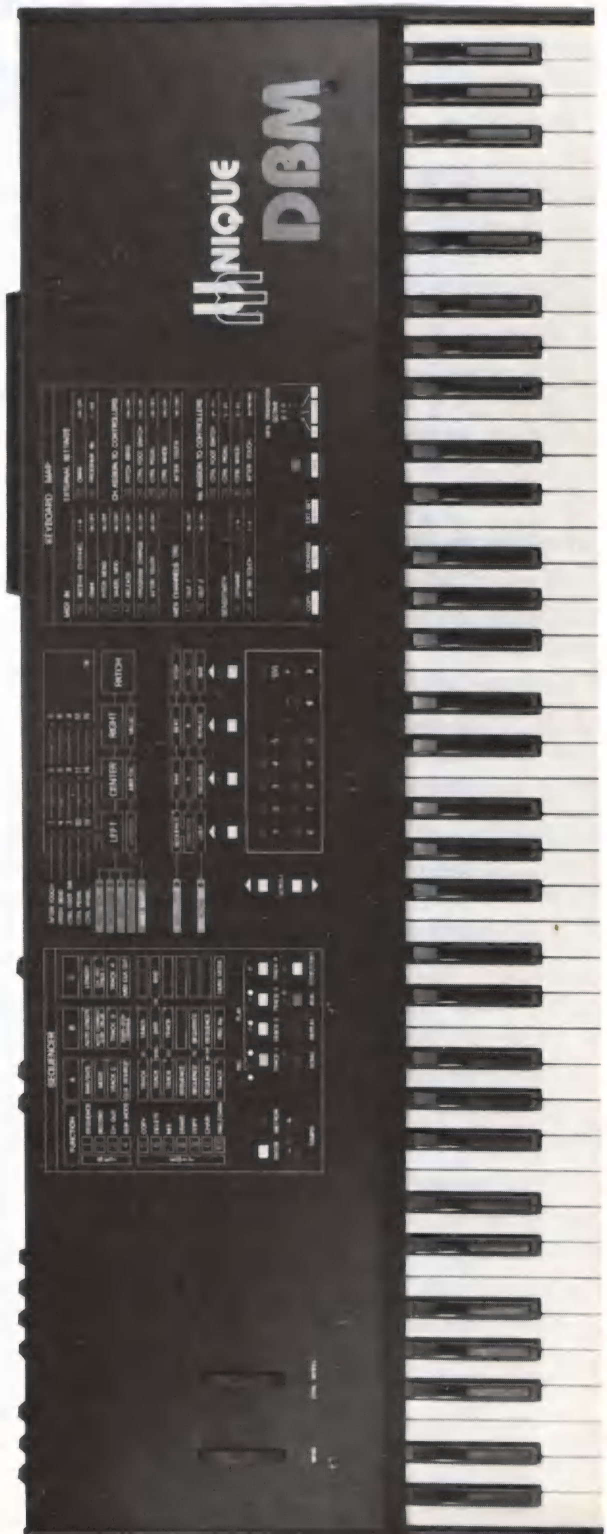


Equalization can make or break the sound of a recording—so use all your options.

Cutting Through the Equalization Jungle

BY CRAIG ANDERTON

We all want our tapes, whether recorded in a friend's basement on a 4-track cassette or in a world-class 24-track studio, to have the best possible sound. . . and much of the quality of the final product depends on proper use of equalization (EQ). But using equalization is not as simple as most folks seem to think.

WHAT'S WRONG WITH THIS PICTURE?

A producer wants a brighter sound on a vocal, asks for "more treble," and the engineer turns up the treble control on the nearest available equalizer. Or when asked for more bass, up goes the bass control. Need to accentuate a specific frequency band? Just turn up the boost control, right?

Well, not always. Seemingly one of the best-kept secrets in the recording industry is that equalizers have cut, as well as boost, capabilities. But to understand why boosting is not necessarily the best way to go, we need to consider how equalizers work.

An equalizer is an amplifier whose frequency response can be tailored in a specific manner. Referring to **Fig. 1**, a much simplified filter diagram, some of the output feeds back to the input via a tuned circuit. If this feedback is positive, then the part of the output that falls within the range of the tuned circuit will be added back in with the input signal, thus producing more output level at the tuned circuit's frequency. If the feedback is negative, the output signal will cancel some of the input signal, and therefore produce less output at the tuned circuit's frequency.

> **"Be careful, though; cut too much, and the sound loses its individual character"**

If we can vary the tuned circuit's frequency, we can change the frequency where the boost or cut action occurs. We can even add multiple tuned circuits, each covering a different range, to semi-independently control several parameters at once (such as the familiar bass, treble, and midrange controls found on guitar amps).

The problem with boosting the signal is that because you're adding gain and increasing the level, you could start to bump up against the equalizer's "headroom" (i.e. the maximum dynamic range the equalizer can handle). Clipping becomes a possibility, which of course muddies up the signal, and any circuit with positive feedback tends to be less stable, and more distortion-prone, than circuits with negative feedback (in fact, negative feedback is often used in amplifier design specifically to keep distortion down).

Although boosting an individual equalizer or two may not present any great problem, imagine a mixer with 16 channels of equalization. If you boost one channel, the others are going to sound less prominent, which generally leads to adding a little boost to those *other* channels. Now we open ourselves up to the possibility of exceeding the overall headroom of the mixer itself, not just that of an individual channel, because each channel is hotter than before and pushing a

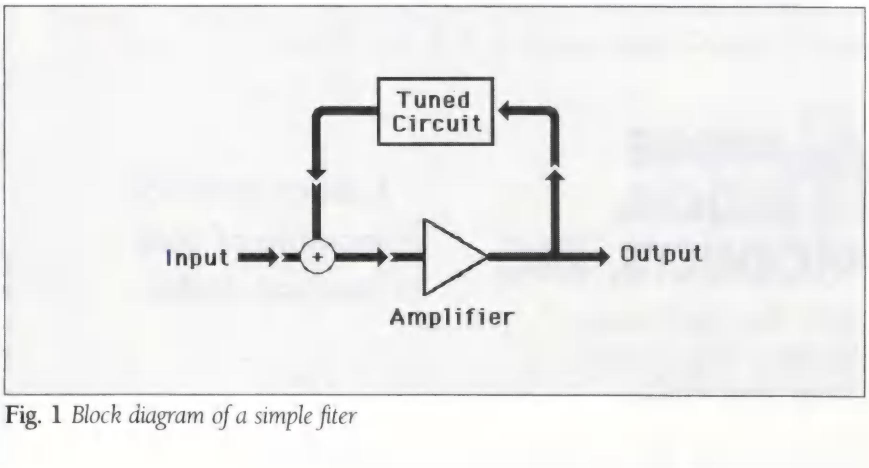


Fig. 1 *Block diagram of a simple fiter*

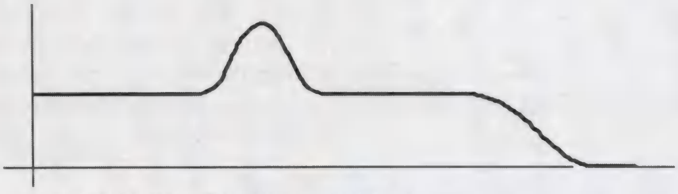
EM *editor* **Craig Anderton** *has produced, mixed, and/or played on eight albums as well as numerous singles. He is currently working with keyboard player Spencer Brewer on* Eden, *their second collaboration for Narada/MCA records.*

lot more signal through the mixer. Distortion, anyone?

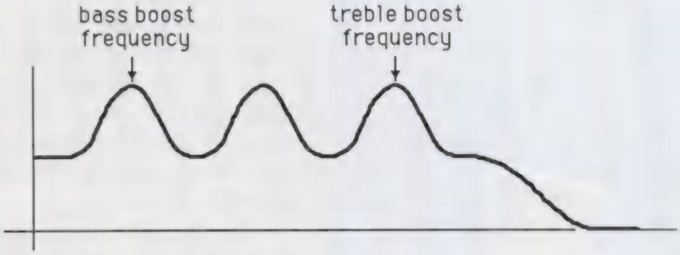
CUT AWAY!

The answer to the above problems is simple enough: whenever possible, cut instead of boost. For example, suppose you're recording a guitar and it sounds a little too flat. One solution is to boost the high end to give it some brightness, and the low end to give it a satisfying "bottom"... but a better strategy is to *cut the midrange.* This technique has the same net effect as boosting the treble and bass, but places far less demands on the system. The only needed compensation is to turn up the track a little bit since cutting will lower the overall level a bit more than boosting, but this is a very small price to pay for improved sound.

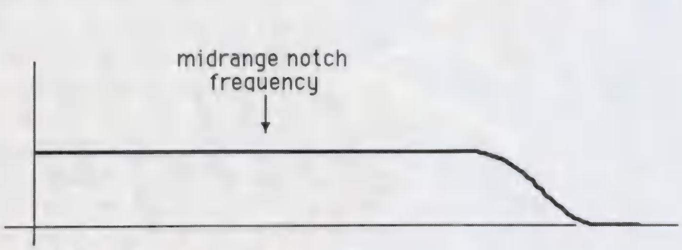
Recently, I mixed part of an album project (*Emerald,* by Brewer/Tingstad/Rumbel on the Narada label) that used several wind instruments (oboe, ocarina, and English horn). Typically, these instruments not only have some characteristic distortion of their own, but also have some sort of midrange resonance peak (**Fig. 2a**). If we try to tame the midrange peak by adding bass and treble boosts, although the signal does become a bit smoother, we now have several "dips" (**Fig. 2b**). These are a real problem, because as the player plays different notes, the level will vary considerably depending on the note's frequency. (At this point the usual answer is to throw on some compression or limiting to even out those variations, which muddies up the sound even more.)



a) smoothed oboe frequency response



b) adding bass and treble boost



c) adding midrange notch

Fig. 2 *Equalizing acoustic instruments that have inherent midrange peaks*

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So instead, what we do is add a complementary amount of cut at the midrange peak frequency (**Fig. 2c**). This reduces the peak's level, improves the headroom, and produces a smoother overall sound. It also lets you print a higher average signal level on tape without any compression or limiting, as you don't have to set levels to accommodate that particularly loud peak.

THEORY INTO PRACTICE

Adjusting the controls for the proper degree of cut is quite simple. First, solo the instrument that has the resonance peak so that you're not distracted by any other sounds. Next, turn up the EQ's boost control a healthy amount—say, 10 to 12 dB (and turn the monitors way down; 10 dB is a fair amount of gain and you don't want to blow your tweeters). Now sweep the filter frequency. When you hit various resonant frequencies you'll probably hear distortion but even if you don't, the increase in level should be obvious. Locate the frequency with the most massive peak, turn down the boost control, and start cutting. Be careful, though; cut too much, and the sound loses its individual character.

Note that this can be a fairly delicate operation if you haven't worked a lot with equalization. If you don't trust your ears, hook up a spectrum analyzer (even one of those eight-band "consumer" units will help) and correlate the effects of notching to the overall spectral distribution of energy. By the way, I usually find that when working with parametric equalizers, I tend to go for broad-bandwidth (low-Q) notches.

I've also had good luck notching some frequencies on vocals and drum machines. With older digital drums, the eight-bit sampling approach produces sounds that lack a bit of brightness. Turning up the treble seems to add harshness, but gently notching some of the lower midrange and adding a touch of psychoacoustic processing (such as units made by Aphex, DOD, EXR, and others that increase the high frequency content without traditional equalization approaches) gives a bright, clean sound without excessive graininess or roughness.

Of course, there will always be times when only boosting will do. But next time you need to mix, try cutting whenever possible instead of boosting. I think you'll like what it does for the sound. EM

The price is right, but does that make a "clone" the computer of choice for musicians? And how important are the initials I-B-M? Find out all this and more in . . .

Send in the Clones!

BY **JASON R. RICH**

It used to be that the musician composed and played music, while the recording engineer turned the dials on the mixing board, ran the tapes and did the editing to create the final sound of the music. This traditional division of labor, however, is starting to break down. No longer does a composer have to sit down at an instrument to compose music by playing a few notes, then stop to write them down so as to not forget them. Just as a writer can use a computer-based word processor to create, edit, print, store and retrieve text, now the musician can do similar tasks with musical notes by entering the wonderful world of MIDI technology.

Until recently, the price of using computers for musical applications was rather high—a typical IBM Personal Computer system cost over $5,000. Today, not only has the price of the IBM models fallen, but also, dozens of companies have introduced inexpensive IBM PC compatibles.

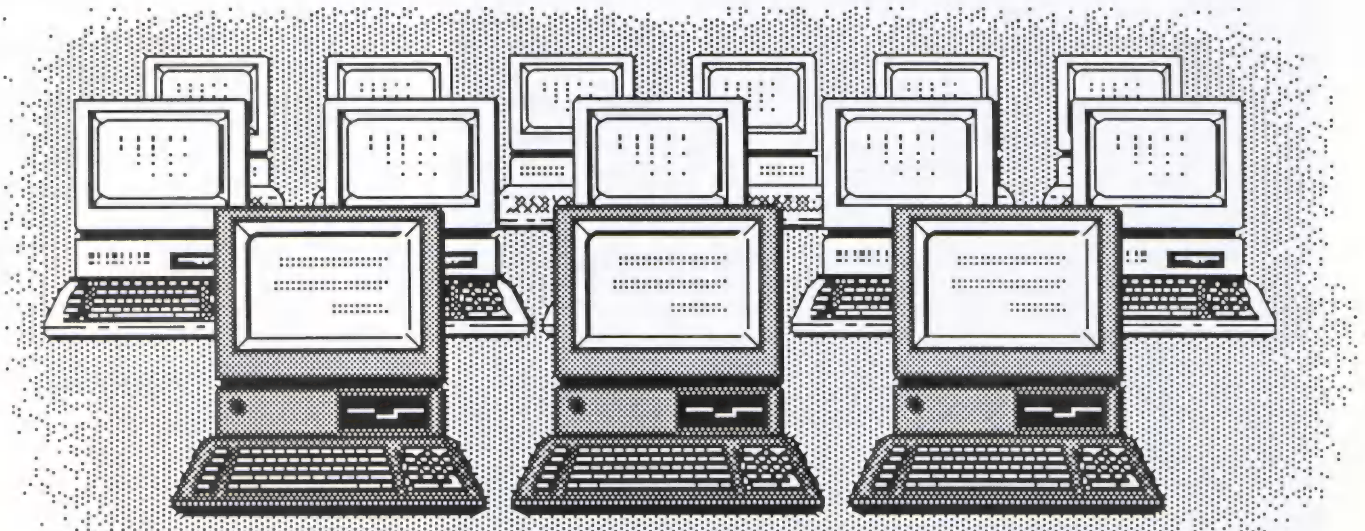
Why choose an IBM PC or compatible for musical applications? First of all, there is no question that the PC and compatible computers offer more computing features, more memory, and faster processing speeds than budget computers like the Commodore-64. Second, many people want a computer for both business and musical use. The IBM personal computer family is supported with thousands of business-related programs, but also enjoys music hardware and software support. There are sequencers, patch librarians, sampler visual editing systems, and more for the PC; all you need to add is a MIDI interface, such as the industry-standard Roland MPU-401 or Voyetra OP-4001. If you already have a PC, it's a simple matter to add the appropriate musical accessories. If you're thinking of buying a computer, the PC might be your best choice if you want a multipurpose machine. In fact, with the current low prices on clones, a PC compatible might even be your most cost-effective option. This article will cover the main features of these machines.

PC BASICS

An IBM compatible ("clone") is a computer manufactured by a company other than IBM yet runs the same programs, uses the same floppy disks for storage, and accepts the same *peripherals* (hardware accessories, such as MIDI interfaces, modems, printers, and such) as the IBM PC. In other words, perhaps the only difference between a true compatible and the IBM PC is the label and the retail price.

One good feature of the IBM PC or

Jason R. Rich, a sophomore at Babson College, writes "Portable Computer (P)review" for Computer Living *magazine. He is the founder of the* Portable Computer Message System, *an on-line service devoted to personal computers, and* Micro Minutes, *a package of one-minute radio segments highlighting useful tips for buying and using personal computers.*



compatible machines is that they are *modular.* In other words, you can assemble a computer system a piece at a time as your budget permits. A basic IBM Personal Computer (or compatible) system consists of the following modules:

Central Processing Unit (CPU). This is the box that contains the computer's memory, the disk drive(s), and the expansion *ports* (connectors) needed to connect the computer to various peripherals. This box also contains *card slots* into which you can plug peripheral circuit boards (cards for short). These cards, made by a number of manufacturers, provide special functions that allow you to "customize" your computer for various applications according to your choice of accessory cards.

Keyboard. Typing on the keyboard sends information into the CPU. The PC's keyboard is similar to a standard typewriter keyboard, but also includes *function keys* (these perform specific functions with a single keystroke) and a *numerical keypad* (for rapid number entry).

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Monitor. The monitor displays the information that the computer is processing. There are two basic types of monitors, color monitors and monochrome monitors. (Variations on these two types exist, such as high-resolution and long-persistence monitors, but these need not concern us). As the name suggests, a color monitor can display graphics and text in a rainbow of colors, while a monochrome monitor is restricted only to green or amber text or text/graphics on a black background. To produce graphics on an IBM PC, an additional graphics card is required (see "IBM PC Display Systems for the Musician," by Allan C. Tamm, in the July '86 **EM**). Some of the IBM compatibles include ("bundle") a graphics card with the system, but separate graphics cards are available from companies such as Hercules Corporation (a company that specializes in PC expansion boards; see DataBank).

A computer would be useless without some kind of long-term storage device. Currently, the most common form of mass storage is the 5.25-inch floppy disk drive. However, the more recent 3.5-inch disk drive (originally implemented by Apple Computer Corporation) is becoming more and more popular among PC owners, primarily because the 3.5-inch disks are smaller, more durable, and often hold more data.

A 5.25-inch disk drive for the PC stores up to 360K (approximately 368,640 text characters since in computer language 1K byte is really 1024 bytes) worth of data per disk. A typical 3.5-inch disk drive stores up to 800K worth of data on each disk. For larger storage capacity—typically tens of Megabytes—a *hard disk* may be installed either within or along side a PC. Unlike a floppy disk drive, the hard disk doesn't use individual, removable disks; instead, the magnetic material that stores data is held in a dust-proof, sealed unit. An additional *controller card* is usually required to allow the computer to "talk" to the drive. Hard disks not only store more information than floppies, but can access that information much more quickly. As you might expect, hard disks are also fairly expensive (a typical price for a 20 Megabyte drive with controller is about $400). One caution with hard disks is that should the disk fail, which it will do at some point because hard disks do not last forever, all your data will be lost. For this reason, even with a hard disk system you need some other form of permanent storage, such as floppies, in order to back up the hard disk data. Another problem involves copy-protected software. Usually you'll want to copy your software over to the hard disk to take advantage of faster operation, but if the software is copy-protected, you may not be able to copy it to the hard disk. Some software companies make provisions for hard disk users, so if you plan on using a hard disk, check into the software company's policies.

Computer memory in the PC, as with all computers, consists of Read Only Memory (ROM) and Random Access Memory (RAM). The ROM contains important system commands and functions that are necessary for the computer's basic operations. This data is permanently encoded in the computer's ROMs, which are not intended to be erased or changed (except with specialized equipment) by the individual computer user.

The RAM stores data temporarily and is the computer's "scratchpad." Programs (software) of a more specialized nature (word processors, spreadsheets, MIDI sequencers, and so on) are usually loaded into RAM; the data generated by these programs is also stored in RAM, and saved to floppy disk for permanent storage.

Both ROM and RAM are measured in kilobytes. For example, 1K (kilobyte) of RAM can store 1,024 characters of information. The IBM Personal Computer, along with all of the compatible machines, is available with various amounts of RAM—64K, 128K, 256K, 512K, 640K or more. Many people purchase at least 512K machines because the extra memory is inexpensive and allows the user to run more complex programs and manipulate more data. Many of the software applications available for musicians on the IBM PC require, or at least recommend, 512K of RAM. MIDI data files tend to eat up a lot of memory, so generally, more is better.

PURCHASING A PC

Since PCs are modular, before purchasing your first computer you need to carefully define your needs, then buy as much—or as little—computer as you need. The first step is to decide what software applications you want to run, then choose the specific commercial software packages that address your needs.

After choosing the software, check for any particular system requirements. For example, some programs require one disk drive, some require one drive but recommend two drives in order to speed up operations, and some programs require two drives. Other programs that do a lot of disk accessing might recommend a hard disk. Also, some software is designed to run with specific graphics cards. And all programs need a certain amount of RAM; some sequencer programs will relate the amount of RAM to the overall note storage capacity, with more RAM letting you store more notes.

Choosing the software first insures that you will know what types of peripherals will be necessary to complete your system. By defining these needs in advance, you can save hundreds or even thousands of dollars by not purchasing unnecessary equipment (such as an expensive color graphics monitor, when

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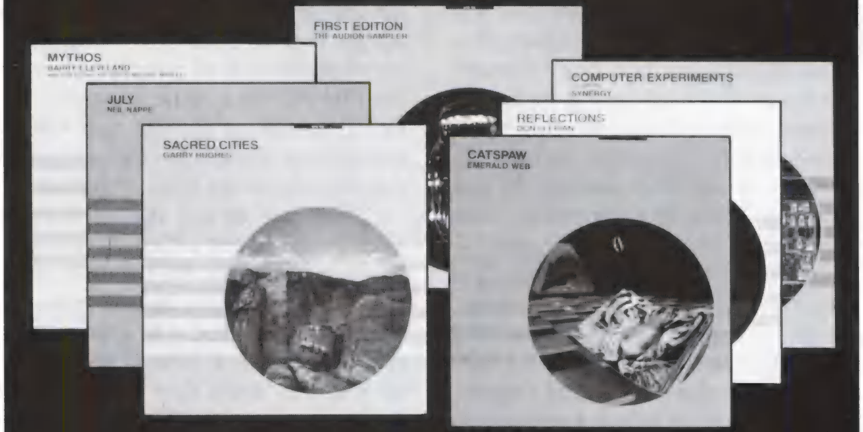

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"By defining (your) needs in advance, hundreds or even thousands of dollars can be saved as unnecessary equipment. . . will not be purchased"

the software requires only a basic monochrome monitor).

Once the required computer system has been defined, the next decision is whether or not to spend some extra money and purchase a "genuine" IBM PC, or invest in an IBM compatible—which tend to cost considerably less, yet offer similar features and computing power. Some typical IBM PC compatibles are the Leading Edge PC, Epson Equity I/II and III, Compaq Portable and Compaq DeskPro, Tech PC, AT&T 6300, ITT XTRA, the Tandy line of IBM compatibles—and the list goes on (and on!). Some compatibles are even available on a "semi-kit" basis, which allows further savings (but if there's a problem, service may be difficult to obtain).

The PC market pretty much consists of three types of machines: the ever-popular "genuine" IBM PC, the "Brand Name" compatibles, and "The Generic" compatibles. Just as there are three types of machines, there are also three distinct price categories for these machines, which for the most part run the same software and can perform the same tasks.

The "Brand Name" compatibles are generally less expensive than the IBM PC, and are backed by a company's name and reputation (and warranty). Companies like Epson America, Inc. and Tandy Corporation/Radio Shack are among the leading contenders in the "Brand Name" compatible industry. Their machines are competitively priced with IBM's offerings; the new Tandy 1000EX is IBM compatible, yet is priced under $800 for the basic unit.

The main reason why the majority of consumers support the "Brand Name" machines is support—should something go wrong with the machine, they have the assurance that there will be a reputable company to support it. Local dealers and distributors throughout the country can offer support, and honor any warranties that are offered upon purchasing the machine. Many people feel that "Name Brand" compatibles are worth spending an additional few hundred dollars compared to the "Generic" machines. The extra support and piece of mind is often important to the consumer, especially for the musician who knows little about computers and is about to enter the world of computers and MIDI for the first time.

While "Brand Name" computers are cheaper than the IBM PC, the "Generic" machines are the cheapest available, because in many cases, they are imported by small companies and sold through mail order houses. Usually, less support is offered with these computers, and unfortunately often what you see is what you get. In some cases there is no guarantee of quality—or of compatibility with the IBM PC. As a result, programs designed to run on the PC may exhibit strange bugs and glitches when run on a machine that is not fully compatible.

There are mixed opinions as to whether purchasing a "Generic" computer is worth the risk. According to some surveys, people buying their first personal computer often choose to spend a little extra and go to a local dealer, mostly because they know they will be able to depend on the machine and also take advantage of personal, one-on-one support. Also, with the price of "Brand Name" compatibles dropping so quickly, the cost of a fully IBM PC compatible computer system starts around $1,000.

With as volatile an industry as musical electronics, the number of IBM compatibles and software programs seems to change daily. However, there is one very important point to remember when looking at any clone: none of the IBM compatibles are 100% compatible. In fact, even the machines that are most like the IBM are different in one way or another. The biggest difference for musicians is the computer's internal clock speed, as some music software is programmed to use the internal clock speed (4.77 MHz) of a "genuine" IBM PC. Running that software with a compatible that has a slightly different clock could cause problems; specifics depend on the software being run. Fortunately, it's easy to check the clock speed of a computer, as this is almost always given as part of the specifications. Another compatibility problem concerns disk drives and controllers. There have been instances where updates of a program haven't run on systems that could run the original version! Sometimes this is because the disk drives and controller cards are not sufficiently IBM-compatible. Fortunately, the amount of music software for the PC is not that huge a universe, and most software companies are aware of what systems will and will not work with their software.

Finally, run the software you want to use with the computer *before* you buy, if at all possible. If not, then call the company that makes the software and ask if their software will run on the computer that interests you.

A personal computer could be one of the better investments you ever make. If you're considering an IBM PC, I hope the above will help you better understand your options. Happy hunting!

"The main reason why the majority of consumers support the 'Brand Name' machines is support—should something go wrong with the machine, they have the assurance that there will be a reputable company to support it"

A Percussionist's complete setup in one kit...and more!

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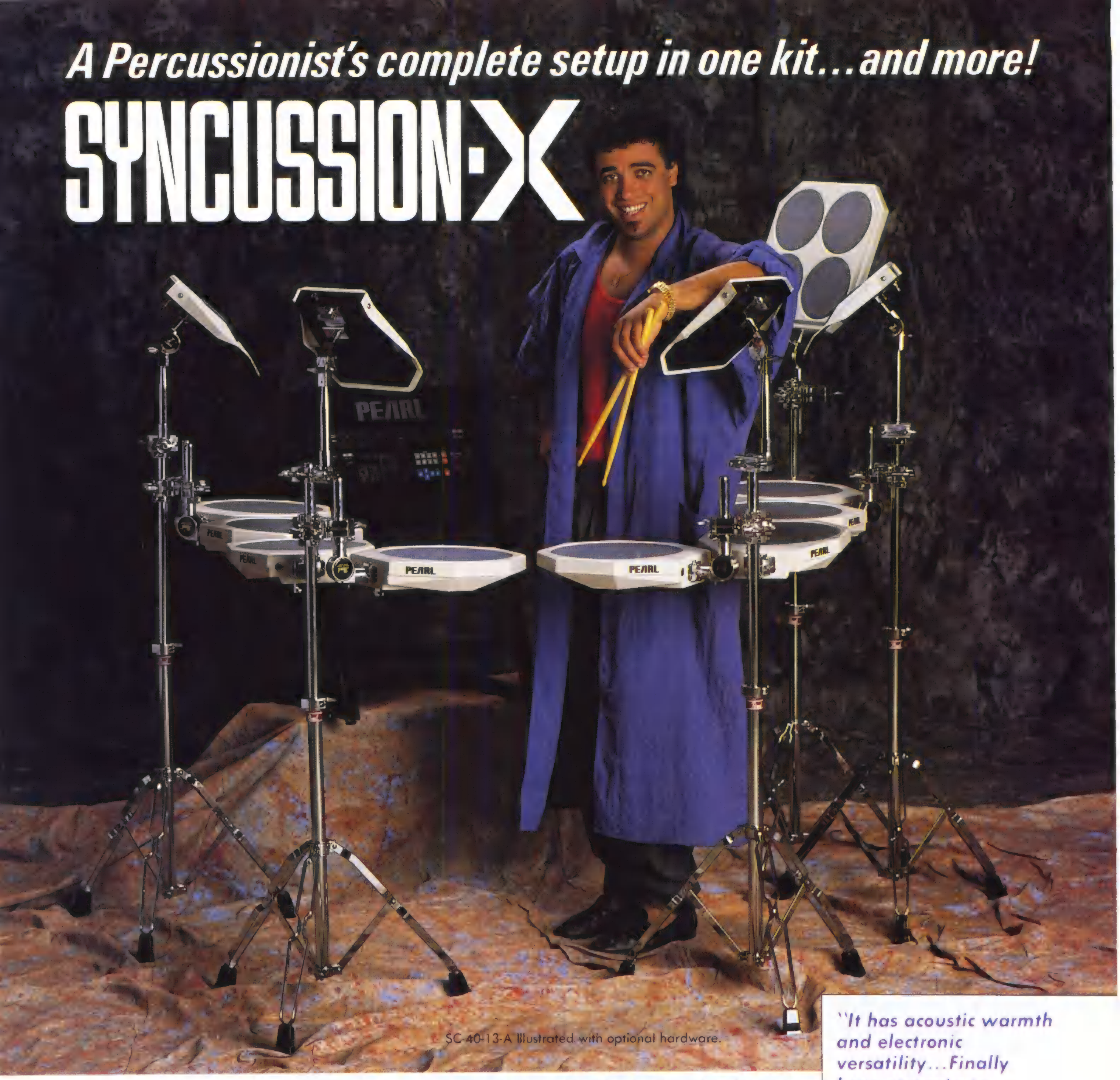

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PEARL

Hooked on modem madness but finding it a costly habit? You need these . . .

Top Ten Telecommunications Tips

(Confessions of a Modem Junkie)

BY RICK SCHWARTZ

After reading **EM**'s September '86 Telecommunications issue, I was a real "terminal" case. I couldn't get enough! There was Esi Street, PAN, Synth-Bank, MusicNet, Delphi, Synth-Net, CompuServe, and the Source, not to mention the hundreds of local BBSs. Using on-line databases, I had up-to-the-minute information at my fingertips: equipment reviews, software update information, even airline flight schedules. Furthermore, thanks to message boards and teleconferencing, I could express my opinions in a forum of industry experts. I was no longer lost in the "information age"—thanks to on-line services I had a grasp on our ever-changing industry. Everything was great . . . until I received my first bill, which gave me a serious case of "connect-charge hangover." It was either join Baud-aholics Anonymous or take drastic action to reduce my bills. I chose the latter, so here are my Top Ten Telecommunications Tips:

1. LIFE IN THE FAST LINE

Consider investing in a 1200 or 2400 Baud modem. Even though some networks charge more for high speed modems, you will still come out ahead, because the increased rates are more than offset by the speed at which you are able to download data. The savings will be considerable, especially if you plan to download sound patches. If you shop around, you can find good deals on high speed modems; I picked up a good Hayes-compatible, 1200-Baud, auto-answer modem for less than $100 (Avatex 1200).

2. CHOOSE THE RIGHT SOFTWARE

Communications software is an often-neglected area, since most companies provide free terminal programs when you buy their modem. Do not settle for bundled software; if it was that good, they wouldn't be giving it away. Commercial programs have features that can save you time and money. Some terminal programs allow you to store text which can later be recalled using your keyboard's function keys. Use this method to enter user-ID, password, and navigational commands.

> **"... in large metropolitan areas there are many access numbers to choose from and it's not always clear which is the best to dial"**

You may be surprised just how fast time flies when you are on-line in a hot debate, downloading sound patches, or just reading messages. Look for software that includes a built-in clock with an elapsed time indicator to remind you how long you have been connected (if you dare to know!).

3. BY-PASS MENUS AND USE ABBREVIATIONS

Avoid menu-driven systems when you can—while menus are convenient for beginners, they slow down proficient users. Many telecommunications services have "expert" or "immediate" modes that

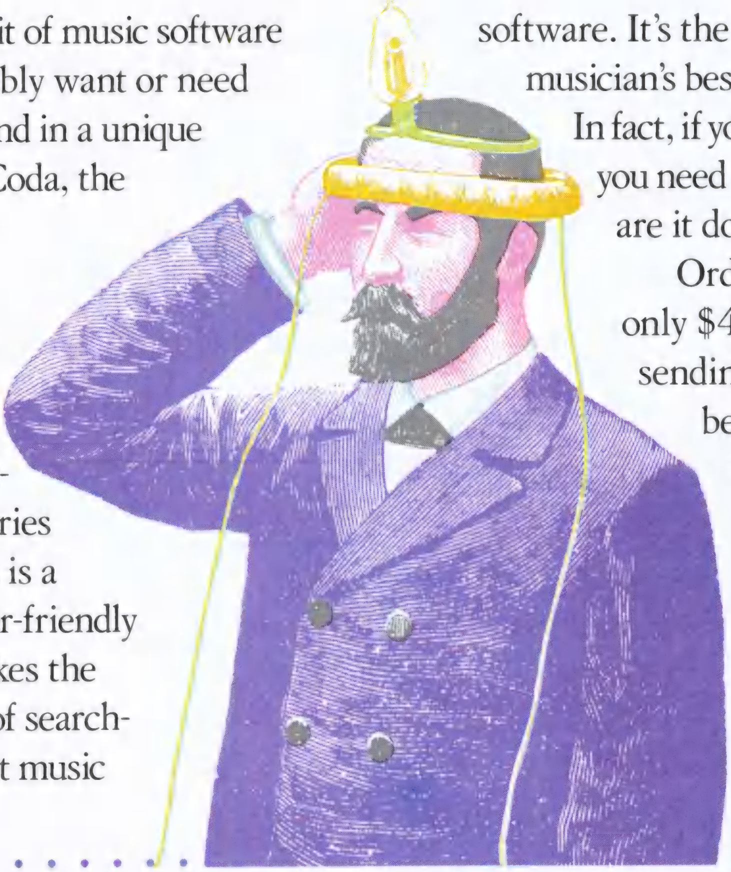
Perusing PC Pursuit

For a one-time sign-up fee of $25 and a flat $25 per month, PC Pursuit (a service of GTE Telenet) lets you make an unlimited number of long distance connections during evenings and weekends. Subscribers can also use PC Pursuit during business hours at reduced rates. The service can be accessed from nearly 17,000 local telephone exchanges via the Telenet network. You can dial thousands of free databases at 300 and 1200 baud in 14 major cities across the nation, 24 hours a day. The current list of cities includes Atlanta, Boston, Chicago, Dallas, Denver, Detroit, Houston, Los Angeles, Newark, New York, Philadelphia, San Francisco, Seattle, and Washington D.C.; more are promised.

For more info and registration, call their voice lines (800/368-4215, 8 a.m. to 5 p.m. Eastern time; Customer Service is 800/336-0427). To access the BBS data lines, call 800/835-3001 (24 hrs.)

***Rick Schwartz** works for Serafine FX, whose credits include* Poltergeist II, Short Circuit, Star Trek, Tron, *and* Brainstorm. *Rick attended the University of Nebraska and studied Electrical Engineering; he has managed a 24-track recording studio, toured with many national acts, and is currently writing software for the Amiga computer.*

If you feel like a lost soul when it comes to music software, get the bible.



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let you jump to specific areas of on-line databases. Also, commands can often be entered in abbreviated form. Write down commonly entered command sequences and use "expert" modes for faster access.

4. Try Automatic Log-On

Intelligent modems have features such as built-in phone dialers. When combined with the proper communications software, you can call up the host computer and sign on automatically. Although you might think of this as a time-saving rather than money-saving feature, with some services if you make a mistake or typo while logging on, the system will cut you off, thus necessitating a re-dial.

> **"It was either join Baud-aholics Anonymous or take drastic action to reduce my bills"**

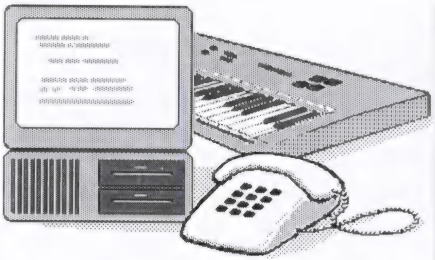
5. Do As Much As You Can Off-Line

A cardinal rule of budget telecommunications is *do not read mail or write letters on-line.* All good terminal software will allow you to capture incoming text and read it later; I know what a temptation it is to whip off a reply when there is new mail in your box, but you are much better off capturing text so that it can be read and answered later. Compose your reply off-line and sign-on again to mail the letter. With most networks there is no flat fee to log on, although there may be a three-minute minimum connect time.

6. Nighttime Is The Right Time

Try to avoid high daytime connect charges which could be as much as $24/hour (ouch!). This should not be much of a problem since musicians are typically night people anyway. PeopleLink (see sidebar) is a great money-saving service for nighttime users.

Another way to save money is to shop carefully. Remember, even though sign-up charges for some networks may be high, check around; sometimes there are limited-time promotions that waive sign-up fees or discount them. Also, some companies offer reduced rates for membership with various services when you buy their gear.



7. Sign Up For Unlimited Long-Distance Access

If you do any long-distance calling to networks, check into PC Pursuit. This incredible service, which operates similarly to MCI, allows you to make unlimited nighttime long distance calls for a flat fee of $25 per month. Although this service is currently only available to large cities, new areas are being added all the time (see sidebar on page 44).

The PeopleLink Story

PeopleLink offers special happy hours (6 to 7 p.m.) for only $2.95/hour (300 Baud). Their normal (off-peak) rate is a mere $4.25/hour, with no sign-up charges. Although not catering specifically to musicians, PeopleLink is fine for posting e-mail, and is accessible nationwide from local access numbers for Tymnet, Telenet, Datapac; if you're in Chicago, you can also call direct. They even have a PartyLine service which allows you to talk live with other users on a private line or hold group conferences at very low rates. For more information:

Write: American PEOPLE/LINK Arlington Ridge Office Center, 3215 N. Frontage Road, Suite 1505, Arlington Heights, IL 60004.

Voice: 800/524-0100 (toll free) 312/870-5200 (Illinois) Daily customer service until 10 p.m. (Central time).

On-line sign-up: (data line) 800/826-8855 (toll free) 312/822-9172 (Illinois).

8. Always Sign Off Before Hanging Up

This has been mentioned before, but bears repeating: some networks do not automatically disconnect upon hang-up, and you may be charged for time that you did not use. Also, make sure Telenet, Tymnet and other access numbers are in your local area of service. This may seem obvious, but in large metropolitan areas there are many access numbers to choose from and it's not always clear which is the best to dial. For example, in my area one of the numbers I dial has a long distance prefix, even though it is still in my local area of service.

9. Take Advantage Of SIGs To Save Money

Do not underestimate the usefulness of SIGs (Special Interest Groups). Now that you're on-line with hundreds (maybe thousands!) of users with similar interests and needs, use your group buying power to make mass purchases on everything from floppy disks to software. You may be suprised at the volume discounts that are available.

10. Purchase Any Available Documentation

Some services publish handbooks, available at extra charge, on how to use the service. These document a variety of time and money-saving tips, and will often pay for themselves in a very short period of time.

Conclusion

Well, it's time for my daily "data fix." I hope you have found some of these suggestions to be helpful. Have fun, save money, and I'll see you on-line!

P.S. For more information on additional services as well as local access numbers try this:

1. Dial your local Telenet access number.
2. Type three carriage returns, (cr) (cr) (cr).
3. You will then receive the "@" prompt sign. Type:

```
MAIL (cr)
USER NAME: PHONES (cr)
PASSWORD: PHONES (cr)
```

You can also try this:

1. Dial your local Tymnet access number.
2. Type D1 at the terminal identifier prompt. Then type:

```
INFORMATION (cr)
```

Sound Experience

Kawai's SOUND experience and excellence in building innovative electronic products has resulted in the creation of the K3 synthesizer system. The foundation of the system, the K3 Digital Wave Memory Synthesizer, is so advanced it has set higher standards of quality in the industry for affordably priced digital synthesizers.

The advanced technology featured in the K3 provides an incredibly wide spectrum of useful voice programs created from a broad base of 32 digitally sampled waveforms.

The K3's keyboard is carefully crafted to be the finest playing keyboard of any synthesizer and features both velocity and pressure response. 100 on board tone patches, "live" editing of patch parameters and full MIDI implementation give the K3 a true performance edge over the competition. Performance features on the K3 are designed to enhance — not hinder — your personal style. The user friendly programming system together with its programmable digital wave form makes creating and storing your sounds easier than ever before.

The K3 sound experience continues with the new K3M Module. The Kawai K3M is not a mere keyboard clone, but is specifically designed to enhance the performance of any Midi synthesizer. With the K3M you can add the crystal-clear sounds of Kawai's digital wavememory technology to your existing keyboard set-up. When Midi'd to the K3 (or any other synthesizer equipped with Midi Local Control) the K3M provides true Keyboard Split and Range assignment, and Midi Spillover (useful for 12-voice polyphonic performance on the K3). Like the K3, the K3M features 100 on board tone programs, full patch editing functions, 2 user programmable digital waveform settings, and 32 pre-sampled digital waveforms.

KAWAI
K3M
K3

The K3 System

Now, for what most other manufacturers charge for a single keyboard, you can have a complete digital music system featuring both the K3 and the K3M! Also, Kawai has taken advantage of the open architecture of the K3 system by introducing a complete computer support system based on the Atari 130XE computer. Jointly developed with Hybrid Arts, the K3 Computer System includes a Librarian for organizing and storing hundreds of tone patches to disk, and a Wave Table Editor for creating and storing to disk hundreds of user programmed digital Waveforms and tone patches. The K3 computer system also features the Midi-Track III, a 16 track, 10,000 note Midi music sequencer.

Conclusions

Before you invest money in a digital synthesizer, take our SOUND advice ... check out the SOUND EXPERIENCE of the Kawai K3 and K3M Module.

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Mail to: **MIX ANNUAL,** P.O. Box 2526, Berkeley, CA 94702. (Offer expires January 31, 1987. Annual will be shipped February 1987).

Would you like a stereo Mirage with about 6 dB less noise? It only takes a few parts, a little bit of time, and the expertise provided in the following article.

The Stereo Mirage

BY DON SLEPIAN

This simple modification to the Ensoniq Mirage Digital Sampling Keyboard takes less than one hour, costs less than $5, and makes an enormous improvement in the instrument for any application.

The analog section of the Mirage comprises eight separate signal processing "modules"—one per voice. My modification groups these eight channels into two discrete stereo outputs that are available simultaneously with the instrument's existing monaural output. I use the old monaural output as an effects send, and route the two new outputs into my stereo mixer.

PROS AND CONS

There are four advantages to this modification. First, the Mirage in stereo is absolutely glorious. I had to fight with myself to write this article, because the improvement is so drastic I was tempted to keep it all to myself! Due to the way the Mirage's 6809 microprocessor scans the keyboard and assigns voices to the eight new discrete outputs, a simple musical scale has the notes flying back and forth across the stereo field. Second, there's a noticeable improvement in the Mirage's signal-to-noise ratio, even when the signals are mixed back to mono. Folks, the hiss is gone! By bypassing the final VCA and summing circuitry in the Mirage, the perpetual quiescent hiss that used to pervade my system is now at a quarter of its former strength—a noise reduction of over 6 dB in both old and new Mirages. Third, there is a distinct improvement in the perceived clarity of sounds, especially in thick or complex layered timbres. In one test, I took the two stereo speakers and placed them on top of each other and listened at a distance so that I knew I was getting absolutely no stereo effect. Upon comparing the sound of the two speakers receiving discrete signals to that of the same signals mixed monaurally, the improvement in clarity was obvious. I don't understand this effect, and my best guess is there is some psychoacoustic difference between mixing sounds electronically and having those same sounds come through different loudspeakers and mix acoustically in the air (see "An Acoustic Mixer" by Terry Fryer in the August '86 **EM**). Fourth, you now have the convenience of hearing the sounds you are sampling through the Mirage's outputs as you sample. This has considerably simplified my sampling setup.

There are also four drawbacks to the modification. First, as the Mirage is powered-up and loads its operating system, it makes eight chirping sounds when its microprocessor issues a clarion wake-up call to each of the eight channels of analog circuitry, and the Curtis VCFs tune themselves up. This comes out at full volume, and would be rather frightening to an audience if you were to power-up your Mirage into a loud PA system in the middle of a gig. I have gotten into the habit of waiting 20 seconds before I turn on the keyboard mixer after first applying power to the Mirage or rebooting its operating system. Second, the volume control on the instrument has no effect on the two

Don Slepian at work and at play.

Don Slepian *has recorded the album* Reflections *on the Audion label, distributed by JEM Records. When he is not surrounded by Mirages, he plays alto recorder and classical guitar.*

> **"First, the Mirage in stereo is absolutely glorious. . .Second, there's a noticeable improvement in the signal-to-noise ratio. . . over 6 dB in both old and new Mirages"**

new outputs. Since I use the old mono output as an effects send, I can use the instrument's volume slider to control that send. Do not mix the old factory output directly with the new ones, since it is out of phase. Third, for performing musicians to take advantage of the beautiful stereo effects and the increased clarity, they must add a speaker and amplifier channel to their stage setup, or run the band's PA in stereo. The old mono Mirage output could be used as a monitor send. Of course, you could just mix the two new outputs together and leave your set-up unchanged—this way you can enjoy the hiss reduction on stage, and leave the stereo effects for the studio. Fourth, you will void your warranty, and companies aren't responsible for carnage you inflict on your instrument in the name of improved performance.

The theory of the mod is really quite simple. The output of each Curtis CEM-3328 VCF (located at pin 9) is buffered with its own internal op amp follower. Just check that no DC offset is present (or AC couple the output), isolate the signals with a bit of resistance, and send the outputs to the outside world.

NECESSARY PARTS AND TOOLS

I don't recommend this mod as your very first project, but if you have successfully built a few kits, this should be easy. You will need the following tools:

✓ Set of Allen wrenches
✓ Small Phillips screwdriver
✓ Roll of electrical tape or heat shrink tubing
✓ Drill with ⅝-inch bit
✓ Low-wattage (25 Watts or so) fine-tip soldering iron
✓ Rosin core (*not* acid core) solder suitable for electronic construction.

You will also need the following electronic components:

✓ Two mono open-circuit phone jacks (Radio Shack part #274-280 or equivalent) preferably with nonconductive plastic shells
✓ Eight 10K ¼-watt resistors (two packs of Radio Shack #271-1335 or equivalent)
✓ A small spool of light gauge wire, or an 18-inch or longer piece of ribbon cable (eight conductors minimum, ten if you don't have any light gauge wire and need to strip two wires off the ribbon for the ground connections described below; try Radio Shack #278-772).

What you're going to do is connect the wires to each of the Mirage's eight analog outputs, use the resistors to construct two separate four-channel passive mixers, and then connect the outputs of these mixers to the female phone jacks, thus creating the new stereo outputs.

PRECAUTIONS!

Internally, the Mirage is a delicate and complex instrument. The moment you open it up you are on your own. I am not liable for any consequences of your actions. If you're not willing to be completely responsible for your results, then don't attempt this mod! Take precautions against static electricity, don't eat or drink while working, don't allow any distractions, work slowly and carefully, and finish the entire job in one session.

If you are working on a keyboard Mirage, you will have to remove the keyboard. Note carefully the orientation and exact placement of the keyboard ribbon connector on the Mirage motherboard. On my ancient 1984 model Mirage the cable was oversized for the receptacle and offset by one hole. Whatever it is on yours, be sure to study it carefully during disassembly so you can reassemble it properly. Notice also how the keyboard cable is tucked underneath the keyboard. If you don't tuck it in properly upon reassembly you will end up putting a mounting screw right through the cable (as I did on my first attempt).

PERFORMING THE MOD

The instructions below are for modifying the Ensoniq rack. Aside from some physical differences, the mods are electronically identical.

My approach is to build everything necessary for this mod first, then install it into the Mirage. There is only one slight difficulty. The Mirage, like most digital instruments, has several different grounds.

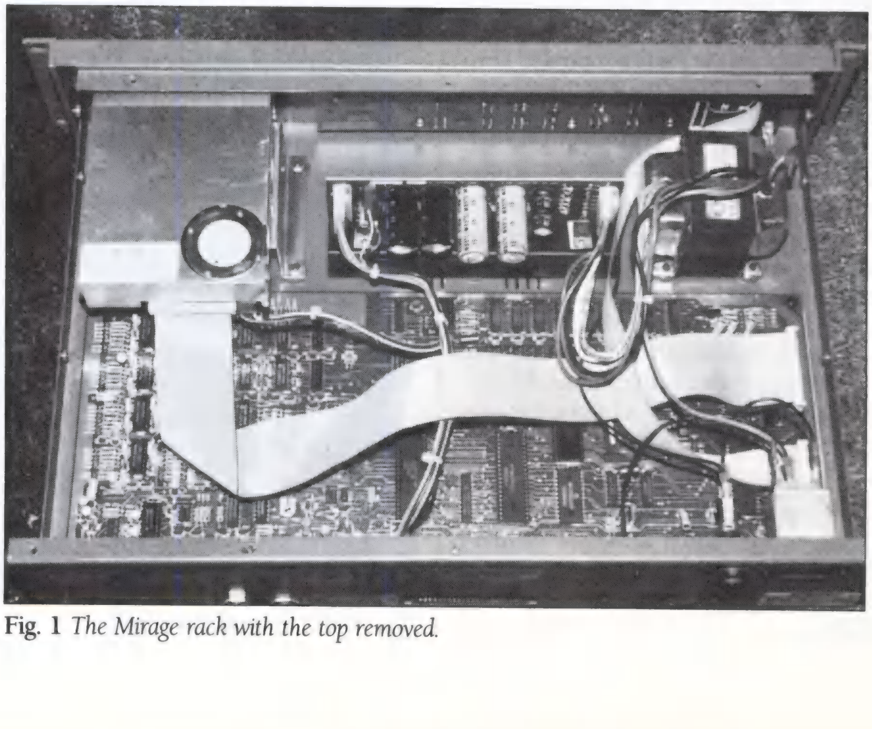


PHOTO: DON SLEPIAN

Fig. 1 *The Mirage rack with the top removed.*

PHOTO: DON SLEPIAN

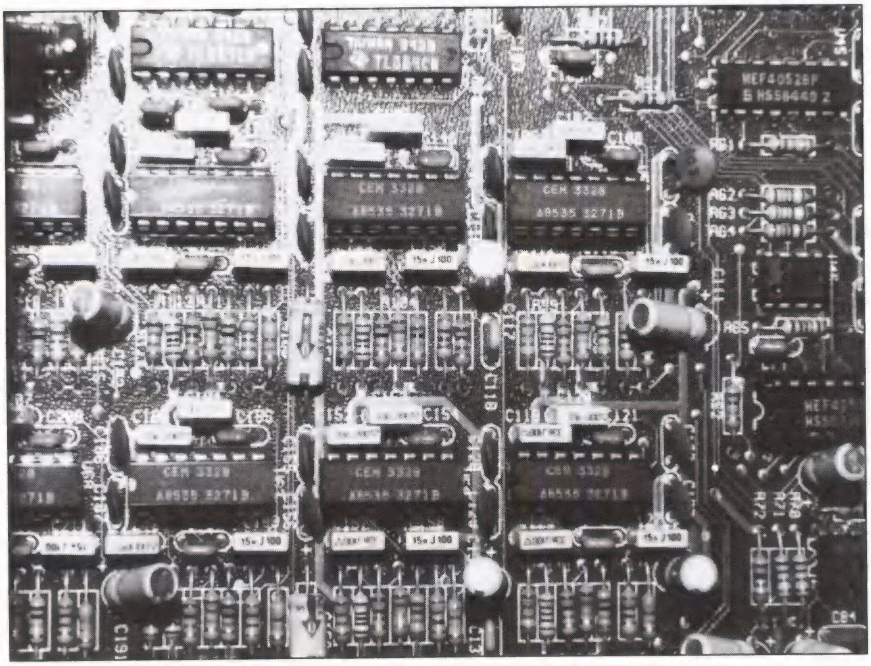


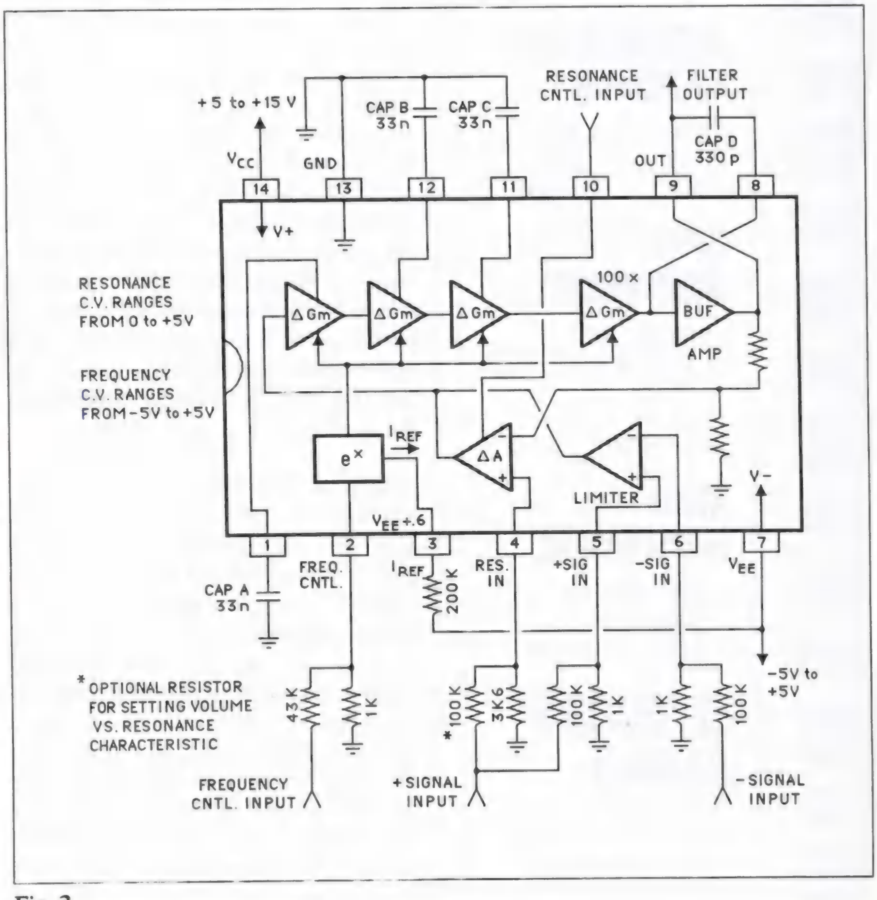
Fig. 2 *The analog section of the Mirage; note the CEM3328 VCF chips.*

The instrument's metal case is connected to the power supply ground, and the digital and analog circuitry each have independent grounds. The two female phone jacks that will become the new stereo audio outputs *must not make any electrical connection to the instrument's metal case.* If you can find female phone jacks with nonconductive plastic shells (as used in the Mirage) your troubles are over; I mounted the two jacks on a sturdy piece of plastic, then mounted the plastic onto the Mirage's case. An easier but less physically secure solution would be to use in-line phone jacks (Radio Shack #274-340) that hang out of the back of the instrument. You could also use an XLR Jack or your choice of many other non-standard connectors to get around this problem.

Before you open up the Mirage, take one of the ¼-inch phone jacks and locate its ground lug connection. Use a thin piece of wire (or separate one wire from the ribbon cable) and solder a six-inch length to the ground lug. Next, take four of the 10K resistors and cut all their leads to ½-inch. Solder all four resistors to the other ("hot") lug of the phone jack. Cut an 18-inch length of the ribbon cable and separate off a four-wire strip. Solder each wire to one of the unconnected ends of the four resistors. Wrap these connections in electrical tape, or heat shrink tubing if you're so inclined.

Prepare the other phone jack similarly by mounting the remaining four resistors and ground wire. Solder the ends of the resistors to another four-strand strip of the ribbon cable. Now we are ready to open the Mirage rack and install the modification.

Remove the top cover by removing the 12 screws with a 5/64-inch Allen wrench (**Fig. 1**). Carefully remove the cables to the disk drive and front keypad, and draw a map of their orientation and placement. Also remove the power cable (Molex connector) and write down its placement. Remove the nuts on the Audio In and Audio Out jacks, and the six black Phillips-head screws (with their star washers) that hold down the main circuit board. Locate the eight CEM3328 ICs (**Fig. 2**). These are the VCFs where we'll be getting our signals. Find the notch at the top of the chip and refer to the top-view pinout (**Fig. 3**) to locate pin 9. Since I found no convenient place to connect to this pin on top of the circuit board without soldering directly to the IC (a risky practice), I removed the circuit board and made the connections to each CEM3328 pin 9 from the underside. Double check that you are attaching the wires to pin 9, and keep your connections tiny and neat. Make sure you have not dripped any solder before remounting the board.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CAP C 33n
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FILTER OUTPUT
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RESONANCE C.V. RANGES FROM 0 to +5V
FREQUENCY C.V. RANGES FROM -5V to +5V
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4
5
6
7
CAP A 33n
FREQ. CNTL.
I_REF
200 K
RES. IN
+SIG IN
-SIG IN
V_EE
-5V to +5V
*OPTIONAL RESISTOR FOR SETTING VOLUME VS. RESONANCE CHARACTERISTIC
43 K
1K
*100 K
3K6
100 K
1K
1K
100 K
FREQUENCY CNTL. INPUT
+SIGNAL INPUT
-SIGNAL INPUT

Fig. 3

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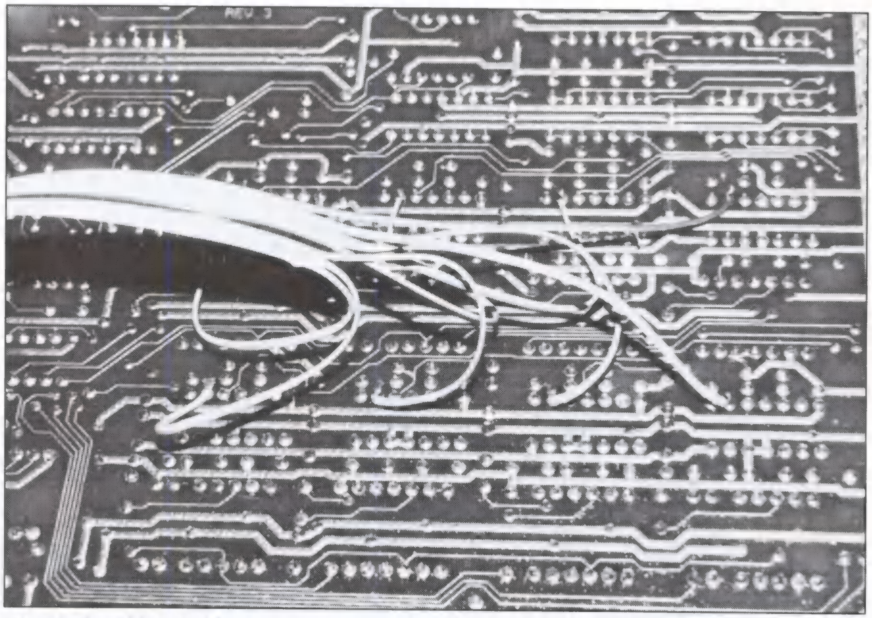

Fig. 4 *The ribbon cable connects to pin #9 of the CEM3328 filters on the underside of the board.*

PHOTO: DON SLEPIAN

THE SMOKE TEST

Now reinstall the circuit board and all the connectors that fit on it. Take the wires that connect to the ground lugs of the phone jacks, and solder them to the metal mounting clips on the top of the audio out jack on the Mirage circuit board. At this point you should check your work. First, turn on the Mirage and verify that the old audio output jack works. Play a two octave scale and make sure all the notes sound. Then connect the two new jacks to your mixer, pan them to full stereo, and turn down the old output (set the Mirage's volume slider all the way off). Play a scale again and check that each note sounds. If any notes are missing go back and check your connections. If all is well, mount the new stereo outputs ***(make sure they make no electrical connection to the case),*** and close up the Mirage.

GOING ALL THE WAY

There are some other possibilities for this mod. First would be to use an active op amp mixer rather than a passive resistor network, as you lose about 9 dB of gain across the passive mixer. Using a good op amp, your signal-to-noise improvement over a standard unmodified instrument could be better than 12 dB, just by virtue of maintaining unity gain and avoiding that 9 dB output drop. I would recommend the SSM2134, a super low noise improved replacement for the 5534 standard op-amp. Write to Solid State Micro Technology for Music, 2076B Walsh Avenue, Santa Clara, CA 95050 or call them at 408/727-0917 for details on this chip. Bipolar power is available from the power supply connector in the center of the Mirage circuit board.

> **"How about driving the CEM3328 VCF's differential signal inputs (pins 5 and 6) with an external audio input?"**

While you're at it, you could tie into the Mute logic line (available at the final VCA or the volume control slider) to mute the sound of the filters tuning themselves up. If you do this, include a switch to defeat the mute logic during sampling so that you can still audition samples as you make them.

Another simple option is to connect eight output jacks directly to pin 9 of the VCFs before going to any summing circuitry. In the studio, these eight independent outputs could all go to different processors, in effect making a homophonic sound from the instrument become polytimbral. Onstage, the best possible approach would be to route the outputs to eight separate channels of amplification. Let these speakers surround the audience. When I spoke with Tom Metcalf, the sampling wizard at Ensoniq, he imagined the eight outputs panned evenly across the stereo field, with a single knob to control the amount of stereo spread.

How about driving the CEM3328 VCF's differential signal inputs (pins 5 and 6) with an external audio input? The audio could be distributed to all eight VCFs (or stereo audio could be split and fed to four VCFs each) for some rather awesome MIDI-controlled filter processing. You could then put selective filtering and resonating effects directly under the control of your MIDI sequencer software without having to buy another piece of equipment. It might also be interesting to mix external audio with the Mirage's own wavetable oscillators as they go into the VCFs. Imagine being able to blend real acoustic feedback into an electric guitar sample! Yes, the Mirage could be quite a powerful MIDI-controlled effects box.

Another possibility is driving the control input (pin 2) with external control voltages. Hmmm, eight VCFs, perfect for generating barberpole filter illusions with my PAiA Shepard Function Generator...

If you get into this level of experimentation, I recommend removing the CEM-3328s from their sockets and using 14-pin DIP Jumpers to connect them to a new circuit board, where you can place all these optional functions under the control of CMOS analog switches. Good luck, please send me a cassette of the music you make, and don't forget to write to the people at Curtis Electromusic Specialties, 110 Highland Avenue, Los Gatos, CA, 95030 (tel. 408/395-3350), for the CEM 3328 data sheet, applications notes, and their latest catalog of wonderchips. Tell them you get these crazy ideas from reading **EM**.

Postscript: The Roland MKS-10 "Planet P" electric piano MIDI Module, a discontinued product, is being sold for $200 at some discount stores and even less second-hand. I think it sounds very pretty, and the price is right. It is actually a 16-voice synth, and separate outputs for each of the 16 voices can be found on pin 12 of the 16 IR3109 chips on the top motherboard. Happy Stereo Synthesis.

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You want a good rhythm sound, and a good lead sound, and sustain, and you want it all now! Well, here's a signal processor that does the trick.

Fuzzstain

BY BILL BERARDI

It's hard to find fuzzbox control settings that are useful for both lead and rhythm guitar; however, placing a compressor ahead of the fuzzbox will help accomplish this by giving a smoother, more consistent sound. The Fuzzstain is a combination fuzz and sustain that takes this idea one step further by having the fuzzbox interact with ("talk to") the sustain. The more the fuzz overdrives, the more it tells the sustain to cut back and vice versa. This results in a well-controlled effect with a lot of sustain.

The fuzz *soft clips,* which imparts a tube-like sound and avoids the harsh clipping of typical solid-state fuzzes. The Fuzzstain *will* scream—but with a slightly mellow tone. The controls allow for adjustable sustain depth, treble, fuzz intensity, output level, and clean sustain/fuzz balance (a nice touch for rhythm sounds).

HOW IT WORKS

IC1a and its associated components preamplify and buffer the input signal. R2 should be 470k for low level signals or 100k for line level signals. IC1b, the second stage, is a variable gain amplifier that provides signal compression. Depth pot R4 determines the maximum gain of this stage; the photoresistor sections of OT1 and OT2 (see sidebar) attenuate the gain below this maximum level in response to signals from the stage built around IC1d (more on this shortly). IC1c provides a Treble control in a boost-only configuration and some low pass filtering. With Tone control R11 turned all the way down, the frequency response is flat out to 8 kHz. (To further reduce highs, you can always turn down the tone controls on your guitar.) With R11 fully clockwise, this stage provides about 11 dB of boost at 5 kHz. Beyond 5 kHz, the gain starts to roll off due to the low pass filtering effect of C6.

IC1d, the fourth stage, is the heart of this circuit and is where the actual distortion occurs. Diodes D1-D4 conduct during the peaks of the waveform, thus placing one of resistors R18-R21 (as selected by Intensity switch S1) in parallel with feedback resistor R14 and reducing the stage's gain. Since the gain is reduced (but not zero), the amplifier will soft clip the peaks. On the very highest peaks of the waveform, the LEDs of OT1 and OT2 will turn on and thereby limit the absolute maximum output voltage.

Now let's look at what happens when you play. With no input signal present, IC1b is at its maximum gain. When you strike a note, the initial signal at IC1d's input will be large because of IC1b's high gain. This will cause the output signal to limit, and current to flow through the LEDs of OT1 and OT2. The light from the LEDs will lower the resistance of the photoresistors connected across IC1b's feedback loop, thus reducing the gain of the second stage and therefore decreasing the amplitude of the signal going into IC1d. This will in turn reduce the current through the LEDs, which will then cause a further gain adjustment, and so on. In a few milliseconds IC1b's gain will stabilize to a point where the signal will just barely turn on IC1d's LEDs during peaks of the signal. As the note dies out, IC1b's gain

__Bill Berardi__ is an electrical engineer who has been tinkering with electronic music circuits for eight years. Although his primary instrument is keyboard, he also enjoys playing guitar and designing guitar gadgets.

PARTS LIST

Resistors *(¼ W, 5%)*

R1, R5, R6, R8, R9	*100k*
R2	*470k (see text)*
R3	*8k2*
R4	*500k audio taper*
R7	*33 Ohms*
R10	*8k2*
R11	*50k linear taper*
R12	*56k*
R13	*1k*
R14, R18	*1k5*
R15	*680 Ohms*
R16	*1k2*
R17	*2k2*
R19	*330 Ohms*
R20	*150 Ohms*
R21	*82 Ohms*
R22	*10k linear taper*
R23, R25	*100 Ohms*
R24	*10k audio taper*

Capacitors *(25 working Volts minimum, 10%)*

C1, C4	*100n*
C2, C3	*10p*
C8, C9, C11, C13, C14	*10μ*
C5	*3n3*
C6	*470p*
C7	*22n*
C10, C12, C15	*10n*

Semiconductors

IC1	*4136 Quad Op Amp*
D1, D2, D3, D4	*1N4148 or equivalent diode*
D5, D6	*1N4001 diode*
OT1, OT2	*Clairex CLM6000 Opto-isolator*

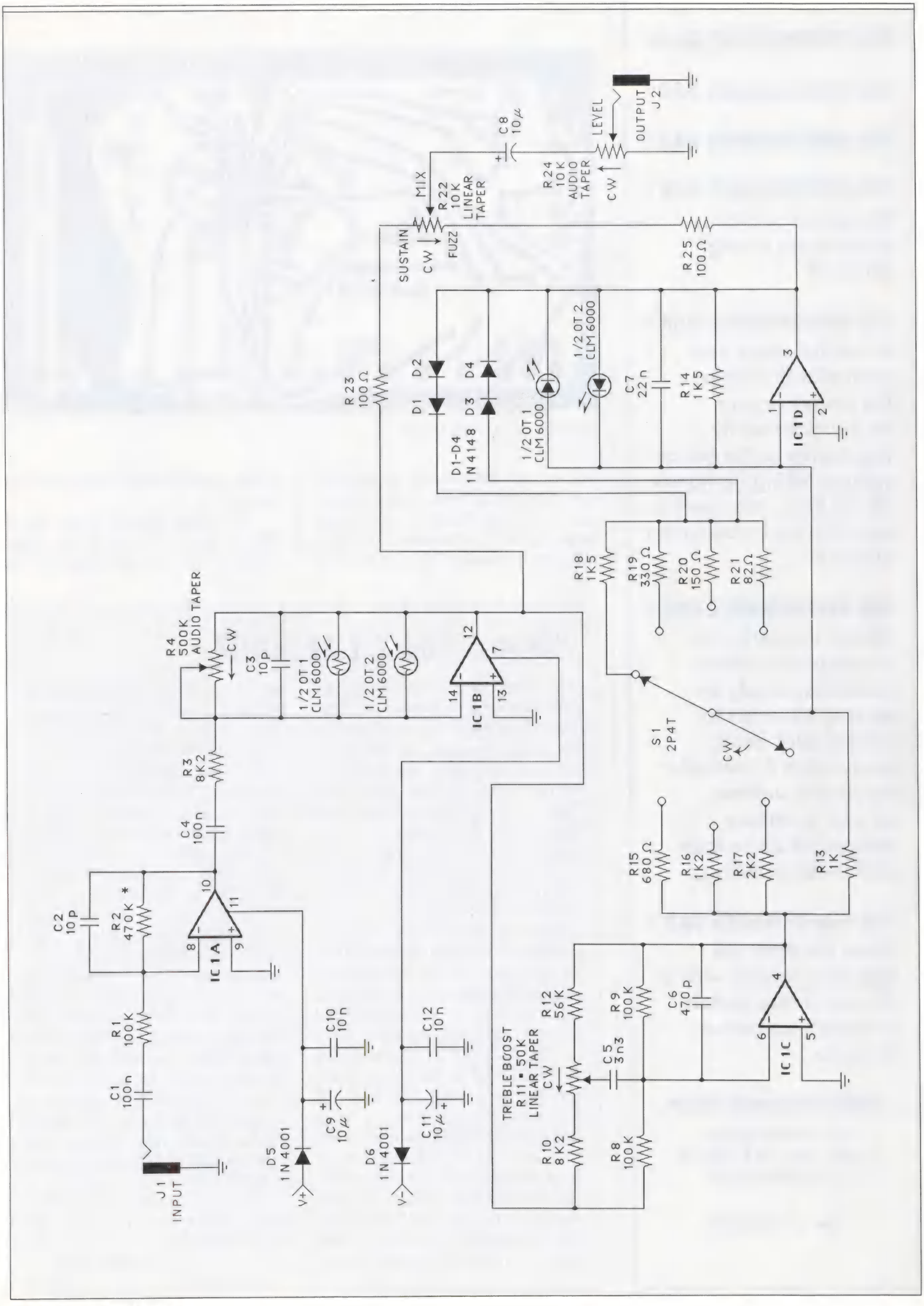
J1
INPUT
C1
100n
R1
100K
C2
10p
R2
470K *
IC1A
8
9
10
11
C4
100n
R3
8K2
R4
500K
AUDIO TAPER
CW
C3
10p
1/2 OT 1
CLM 6000
1/2 OT 2
CLM 6000
IC1B
12
13
14
7
D5
1N4001
V+
C9
10µ
C10
10n
D6
1N4001
V-
C11
10µ
C12
10n
TREBLE BOOST
R11 = 50K
LINEAR TAPER
CW
R10
8K2
R12
56K
C5
3n3
R8
100K
R9
100K
C6
470p
IC1C
4
5
6
R15
680Ω
R16
1K2
R17
2K2
R13
1K
S1
2P4T
CW
R18
1K5
R19
330Ω
R20
150Ω
R21
82Ω
R23
100Ω
D1
D2
D3
D4
D1-D4
1N4148
1/2 OT 1
CLM 6000
1/2 OT 2
CLM 6000
C7
22n
R14
1K5
IC1D
1
2
3
R25
100Ω
SUSTAIN
CW
FUZZ
MIX
R22
10K
LINEAR
TAPER
C8
10µ
R24
10K
AUDIO
TAPER
CW
LEVEL
OUTPUT
J2

Fig. 1 *Fuzzstain schematic*

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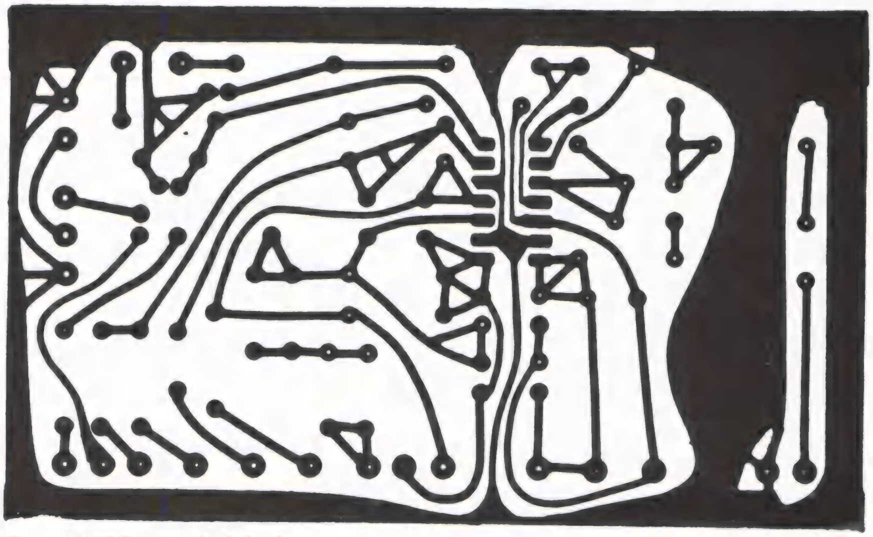


Fuzzstain PC artwork, foil side

will increase automatically to compensate. What this all means is that whether you are playing loudly or softly, single notes or chords, the amount of overdrive will remain constant. This type of circuit is called a *feedback AGC* (Automatic Gain Control).

The voltage required to turn on the LEDs is about 1.5 Volts, so the output voltage will always be just barely ±1.5 Volts

About The CLM6000

This component comprises an LED and wide-range photoresistor in a single, light-tight package. A photoresistor is like a resistor, except that its value depends upon how much light shines on it. With little light, it has a high resistance (10M and more); with lots of light, the resistance becomes much lower (less than 1k). The LED creates the different light changes in response to differing amounts of current flowing through it; so, you can think of the opto-isolator as being electrically equivalent to a variable resistor. By the way, note that opto-isolators designed for digital logic applications (such as the MCT-2 and similar types) will not work in this application.

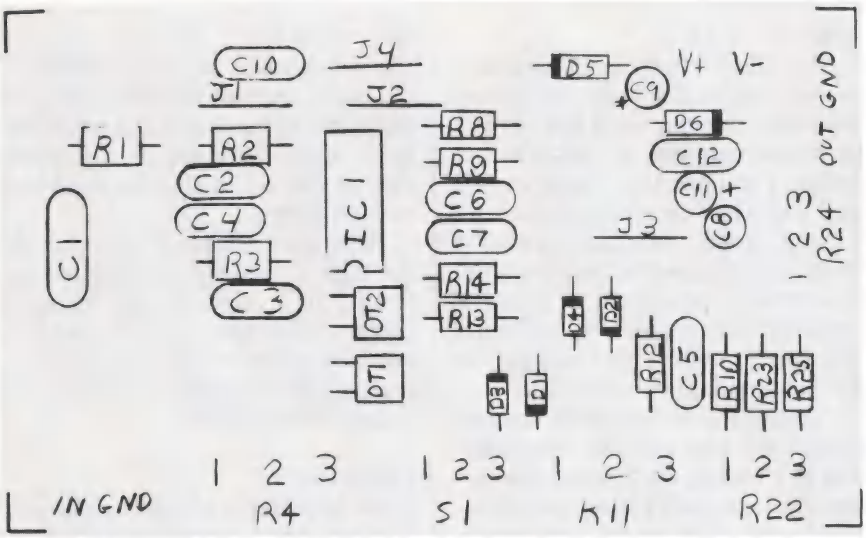
The CLM6000 has four leads, two for the LED and two for the photoresistor. The two photoresistor leads are long and skinny and come out of one end of the CLM6000, whereas the two LED leads are shorter and protrude from the opposite end of the part. The cathode end of the LED (the one with the bar on the schematic) is indicated by a little dot painted on the package next to the lead. The photoresistor leads are non-polarized. It's important to carefully note which lead is which, since a circuit with an improperly installed CLM6000 will not work.

Both the photoresistor and LED inside the CLM6000 are sensitive to head, so solder quickly and wait about a minute between soldering each lead.

The CLM6000 is manufactured by Clairex (560 S. Third Ave., Mt. Vernon, NY 10550; tel. 914/664-6602). Their minimum order is $100, although small quantities are available through Clairex distributors (call or write Clairex for the name of the distributor nearest you). An acceptable alternative can be made by mounting a standard red LED next to a cadmium-sulfide photoresistor (select one with the widest possible resistance range; Radio Shack has an experimenter's assortment package, 276-1657, that will probably yield a suitable type). Enclose both components in a light-tight package, and you've got an opto-isolator.

(Portions excerpted from *Electronic Projects for Musicians* with permission.)

—*Craig Anderton*



Fuzzstain PC layout

at the peaks. Since the combined forward voltage drop across diodes D1-D4 is 1.2 Volts, the output signal will be soft-clipped between 1.2 and 1.5 Volts. The circuit can be powered from bipolar (split) supplies between ±5 and ±15 Volts. To convert the circuit for use with a single 9 Volt battery, see the section on Modifications.

CONSTRUCTION

The Fuzzstain is a high gain circuit, so good construction techniques are a must. Don't wire wrap! Make good solder connections and pay particular attention to grounds. Keep the inputs away from the outputs, and try not to cross wires over one another. Keep the decoupling capacitors, C10 and C12, and feedback capacitors C2, C3, C6 and C7 close to the IC. Put the entire circuit inside a grounded metal box. If you rack mount the Fuzzstain, put the circuit card inside the metal box and then attach the box to the front panel. Make sure the bodies and shafts of the pots are grounded too. Shielded cable isn't necessary for any connections to the pots or jacks if the entire circuit is shielded by the box. For convenience, you can mount resistors R15-R21 directly on rotary switch S1.

SETUP

To start, set the Depth control about two-thirds of the way up, Tone up about one-third, Intensity to Position 3 (i.e. R20 and R16 selected), and Mix fully counterclockwise (sustain only). Turn the output level down all the way. Plug your instrument into J1 and your amp (which should have a high input impedance—at least 50k) into J2. If possible, set your amp for line level input. Now strike a chord and adjust the output control for a comfortable listening level. The sound should be basically clean but highly compressed. As you turn

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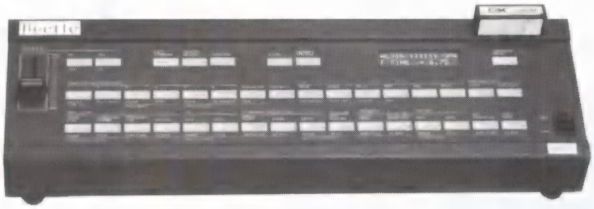

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the Mix control clockwise, the sound should change gradually from sustain to fuzz and the volume should increase slightly. Set the Mix control halfway, and try going back and forth between single notes and chords. Both should be nicely distorted, and of roughly equal volume. Try holding a single note. Increase the Depth control if the fuzz doesn't hang on long enough.

To experiment with the Tone and Intensity controls, first adjust the Mix control all the way clockwise (maximum fuzz). Intensity control Position 1 gives you just a touch of distortion. Position 2 is a nice crunchy rhythm sound. Position 3 is especially useful for combinations of rhythm and lead. Position 4 gives fat leads and raunchy chords. Increasing the Tone setting will add brilliance to the sounds, especially the chords. Many different sounds are available by using various combinations of settings. Position 1 with the Tone turned down gives silky smooth leads and a warm rhythm sound, while Position 4 with the Tone at maximum provides razor blade leads and chainsaw chords.

The Mix balance control (clockwise for fuzz, counterclockwise for sustain) mixes in some clean sound with the fuzz for a more transparent rhythm sound. Settings 1 and 2 on the intensity control work well at full fuzz, while settings 3 and 4 work best with some sustain added. A setting of half is good for position 4, and two-thirds for position 3. Of course, if you're not interested in a rhythm sound and want the fuzziest lead possible, set the mix control all the way to fuzz.

Finding a sound that works for both rhythm and lead can take some time. Start by choosing a lead sound that you like. With the guitar's bridge pickup selected, set the Mix control all the way to fuzz, and adjust the Depth control for the right amount of sustain. Now choose the desired intensity setting. To check out the rhythm sound, switch both pickups on, with the bridge pickup turned up all the way. Adjust the bass pickup to give the sound just the right amount of warmth. If you are using Intensity setting 3 or 4, back off the Mix control to add in some clean sound. This will make the chords less muddy, yet not dilute the lead too much. Increase the Tone setting to add clarity to the chords and bite to the single notes. Once you get the sound close to what you want, go back and fine tune everything.

If you can't get enough bite even with the Tone all the way up, you might be looking for a sound that the Fuzzstain simply cannot make—soft clipping just doesn't produce as many high order harmonics as hard clipping. See the Modifications section for help.

PROBLEMS

If you follow the schematic exactly and use good construction practices, the circuit should give no problems. However, there are always things that can go wrong with high gain circuits. If the circuit works fine when you're playing, but you get hum or noise whenever you stop, then you probably have the depth control set too high. Remember, the Fuzzstain will amplify any sources of noise in your system. If the circuit starts to squeal and give uncontrollable feedback after a note dies out, then you are probably getting direct magnetic coupling between your speaker and pickup. Move away from the speaker, use a humbucking pickup, then turn down the depth control or use headphones. If you play real loud you may hear a thumping in the bass which seems to come from the ceiling. This is the people in the apartment above you complaining about the noise level. Get them some earplugs.

MODIFICATIONS

The first logical addition to this circuit would be some sort of in/out switching. I have not included it here so as not to distract from the simplicity of the circuit, and because there are a number of good circuits available (see projects 11 and 15 in *Electronic Projects for Musicians* by Craig Anderton—available from Mix Bookshelf, 2608 Ninth St., Berkeley, CA 94710; write for catalog). Here are a few other possibilities:

✓ *More bite:* Reduce C7 and/or C6.

✓ *Using with bass:* For best results with bass, change C1 and C4 to 220 nF, C5 to 10 nF, C6 to 1 nF, and C7 to 47 nF.

✓ *Stereo processing:* You may want to have simultaneous sustain and fuzz outputs for some sort of stereo processing. For instance, instead of adding the signals

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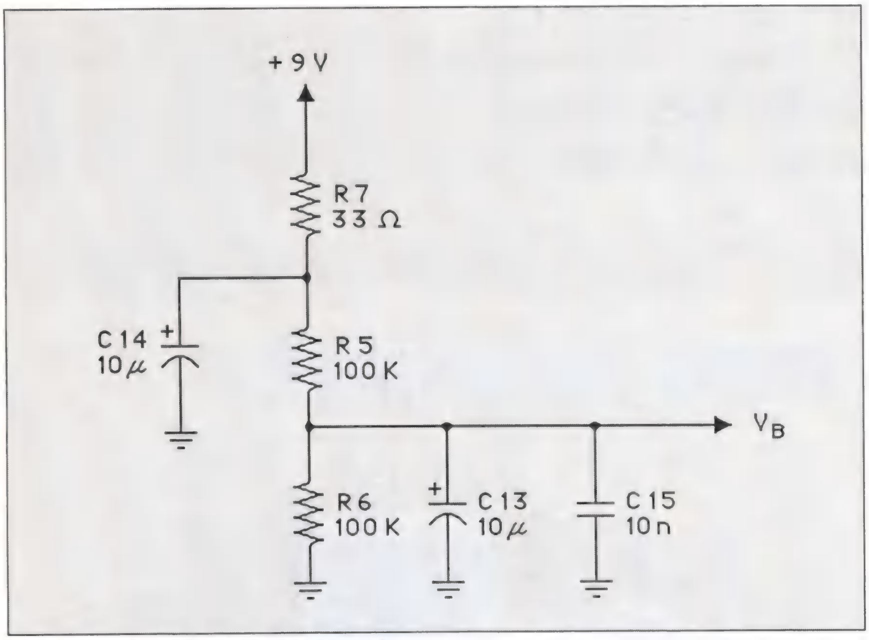

Fig. 2 *Bias circuit for single 9 Volt supply*

electrically, try adding them acoustically by having sustain in one speaker and fuzz in the other. To do this, tap the outputs at the junctions of R22/R23 (for sustain) and R22/R25 (for fuzz).

✓ *9 Volt battery operation:* For those of you who love dead batteries and tripping over little boxes, the Fuzzstain can be operated from a 9 Volt battery. To do this, eliminate D6, C11 and C12, and ground pin 7 of IC1. Instead of connecting the + inputs of the op amps to ground, connect them to Vb (short for bias voltage) from the bias circuit in **Fig. 2.** The input and output jacks and the pots should remain connected to ground, *not* Vb. Connect the battery between the positive supply and ground, and insert a switch in series with the battery for the on-off function. Alternately, you can switch the power automatically by using a stereo input jack and connecting the negative side of the battery to the ring contact of the jack. When you plug in a *mono* plug it will short the ring contact to ground, thus supplying power to the circuit.

SO BUILD IT!

The Fuzzstain can produce many different fuzz sounds, and your favorite settings will depend on your own personal taste. When experimenting with different settings, remember to adjust the tone controls on your amp. For a greater variety of sounds, run the output of the Fuzzstain through an equalizer. Have fun! **EM**

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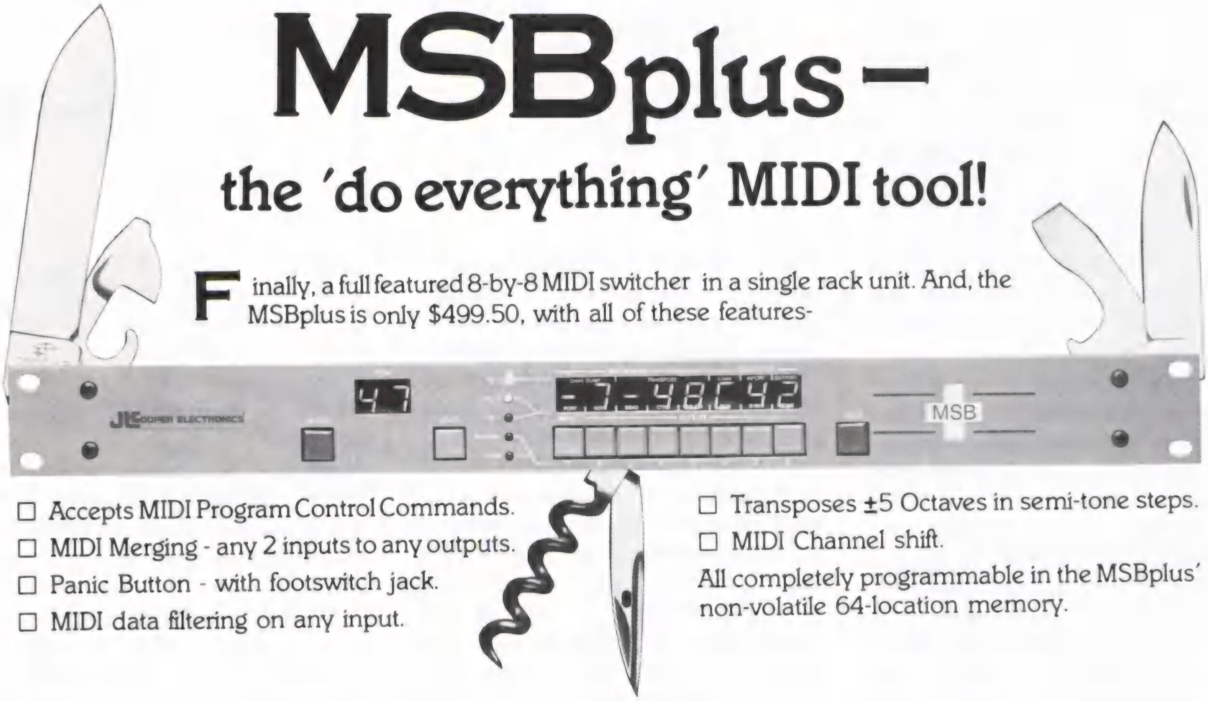

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Service Clinic

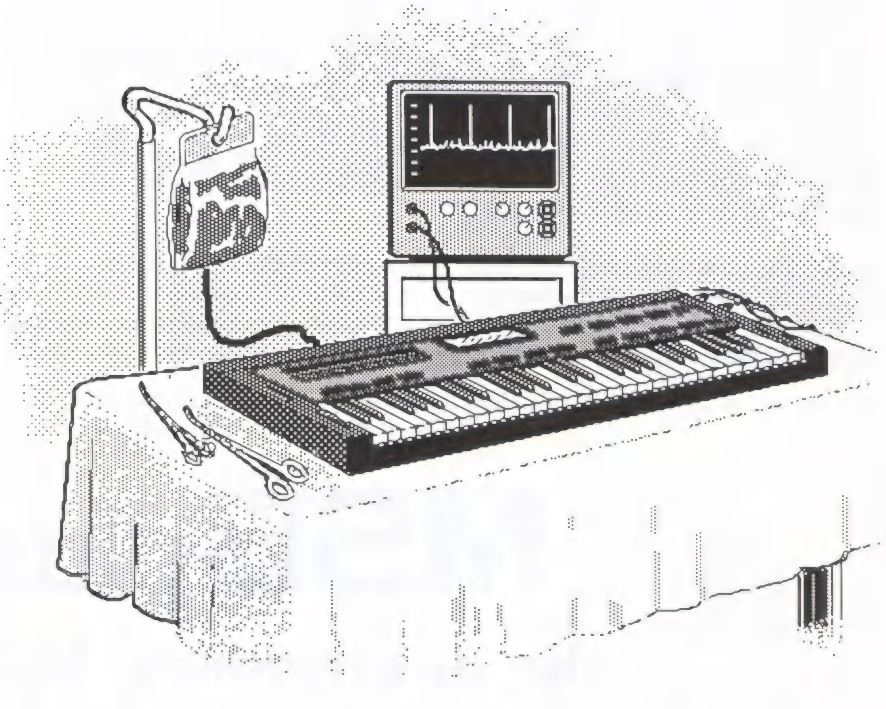
In the dark with your LCD display? Is your tuning control feeling a little out-of-tune? And do all update roads lead to ROM? The doctor is in . . . so let's check with Alan for the answers.

Questions and Answers

BY ALAN GARY CAMPBELL

Please note: Alan regrets that he cannot provide personal replies to questions he receives. However, he will try to answer selected questions in future Service Clinic columns.

I've seen a DX7 with an illuminated LCD display. I was told that this is a retrofit. Will this display work with my TX7?
The retrofit you encountered was the LCD-7 Backlit Display which, unfortunately, fits only the DX7. At present, Yamaha does not plan to release a version for the TX7. An aside: the LCD-7 is definitely a candidate for DIY (do-it-yourself) installation if you're willing to risk voiding the warranty. You simply open the DX (unplug it *first*), unplug/unscrew the existing LCD display, and put in the new one (you also need to unscrew the ground connector tab on the old display, and mount it on the new one, which for some reason is not mentioned in the installation instructions). The LCD-7 may be ordered through any Yamaha dealer. (Note: Addresses for manufacturers mentioned in this Service Clinic are listed in DataBank.)



What's the easiest repair you've ever done?
Excluding those cases of a simple blown fuse, the easiest repair was probably a recent recalcitrant DX7. It would intermittently transpose the keyboard, stop MIDI functions, dump memory—even lock up entirely. I performed some preliminary checks: testing the power supply, monitoring the clock and reset, etc.; but I wasn't getting anywhere. Then I remembered that the owner had recently been in California on tour, and had visited Yamaha International. He'd been given the royal treatment, including a tour of the plant, and Yamaha had installed the most recent System ROM in his DX7 free of charge. Well, there's an old service adage: "If it worked before, you screwed it up when you _ _ _" (fill in the blanks). I pried up the SYS ROM with an IC removal tool and it popped out easily; now, that is definitely *not* normal—the socket usually holds the ROM like super glue. Someone didn't seat the ROM properly. I pushed it firmly back in place, turned on the power and *voila*, the DX functioned perfectly.

The customer was somewhat irate (especially after I handed him the bill), and called Yamaha Service, who was very apologetic and offered to reimburse him. I'm sure that this incident embarrassed Yamaha to no end; but, really, the DX synths are very well made and have an excellent service record. The moral of this story is not to do work on short notice and in a hurry.

What's the most difficult repair you've ever done?
Probably, a Memorymoog with an intermittent cold solder joint on the CIS connector lead carrying the +10V DAC reference to the pots on the Right Side Control board (whew!). The bad joint was seemingly affected by temperature, vibration, humidity, the color socks I was wearing—*everything*. To make matters worse, the symptoms acted exactly like those caused by some of the Memorymoog's early design problems, later solved by various warranty updates (see below)—but the updates hadn't been invented yet! I final-

---

***Alan Gary Campbell** is owner of Musitech,™ a consulting firm specializing in electronic music product design.*

ly found the problem via brute force, by monitoring the bus voltages point-by-point with a DVM. It took days.

My Memorymoog won't stay in tune—I've had it serviced by a reputable service center, but it still comes up "3 TUNED" (i.e., tunes only three of six voices) or worse a few weeks after being serviced.

The tuning on my Memorymoog drifts during performance. Should I have the Autotune update installed?

My Memorymoog sometimes self-edits and "locks up." Sometimes the switches are sluggish and it won't tune. The local service center says I need to have factory updates installed, but these are not covered under warranty. Is this correct?

> **"Memorymoogs, especially early units, suffer from a number of minor problems that can cause units to go out of tune or temporarily fail"**

I recently purchased a Memorymoog, the sound of which I really like, but I started having tuning problems. The Moog comes with a one-year warranty, so it should be covered, but my local authorized service center says that warranty service is only performed at the factory. I can't afford to wait a couple of months to get my synth fixed; I'm working, I need it now. What good is a warranty without local service?

Memorymoogs, especially early units (serial numbers 1700-2500, approximately) suffer from a number of minor problems that can cause units to go out of tune or temporarily fail. Some rather simple warranty updates can fix these bugs. For instance, updates to the Power Supply and/or Common Analog board will solve global tuning problems; an update to the RSC board solves the self-edit problem; replacing the range and scale trimpots on the voice cards will solve voice tuning problems; burnishing the contacts with a miniature relay contact tool will fix switch problems, etc. All these updates are provided under warranty to the original owner of the Memorymoog. Some were once available even out of warranty, but Moog has discontinued this practice.

The only major updates not covered under warranty are the "Autotune Update" and "MIDI/Sequencer Retrofit"; these are *enhancements/options*, installed at the owner's expense. The Autotune Update is a set of ROMs and sample/hold components that prepare the Memorymoog for the MIDI/Sequencer retrofit. This is necessary since the MIDI retro gives the Memorymoog's microprocessor a lot of extra housekeeping functions to perform, thus increasing the sample/hold refresh interval. The Autotune Update is otherwise *not* necessary to the normal operation of the Memorymoog, and may even be undesirable; while it does greatly improve the high-end tracking of the Chord Hold function, it also tightens up the tuning in general, thus eliminating much of the random range and scale error that gives the Memorymoog its fat sound. In any case, the Autotune Update is not a cure-all for tuning problems; it *cannot* be successfully installed *unless the other warranty updates have been installed and tested.* Adding the Autotune Update without the other updates will simply result in continued failure of the unit, and the subsequent inability to properly test and evaluate the Autotune retrofit.

At least some of the Memorymoog's problems can be traced back to Moog Music's troubled relationship with its once-parent company, Norlin Industries. Moog has recently reformed as an autonomous new corporation, Moog *Electronics,* and emphasizes subcontract manufacturing for industry, rather than synthesizer design and manufacture. Unfortunately, Moog Electronics feels that the number of in-warranty units remaining in the field is not sufficient to allow them to cost-effectively provide local warranty service, and now requires that all in-warranty units be returned to the factory for service. While this may seem unfair, Moog is not legally bound to operate local warranty service centers, but only to provide warranty service in-house. It remains to be seen whether or not something can be worked out to assist those Memorymoog owners possessing in-warranty units in the field.

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I have a DX7 with E! installed; every once in a while, the DX locks up or notes stick on. Turning the unit off and then on again will sometimes cure this, but not always. Is this a software bug? Also, the DX diagnostics don't seem to work with the E! board.

Early E! boards used DIP extender pins to connect E! to the DX7 DM board; some of these pins have proven unreliable. To fix this, Grey Matter Response (GMR) now uses DIP ribbon cable jumpers to connect the two boards. If you have one of the older E! boards, you may return it to GMR for modification, or have your local dealer or service center acquire the ribbon cables and install them. GMR will provide the cables at no charge, but your local dealer/service center may charge you for the work. Installation of the cables requires professional soldering/desoldering equipment and is *not* a user mod.

The DX diagnostics are currently not implemented with E!, but future software revisions may re-incorporate them; check with GMR. Meanwhile, if you require the diagnostics, you can temporarily replace the E! ROM U1 with the Yamaha SYS ROM (or have this done by a qualified technician). Running the Yamaha diagnostics with E! *shouldn't* affect the RAM contents, but save any important patches on disk or tape just in case.

I understand that there is an updated ROM for the CZ-101 that fixes some of the bugs in the multi-timbral mode. How can I obtain one?

Actually, there have been three versions of the CZ-101/1000 System ROM, including two revisions. The current revision is termed "Version III" and is Casio part number M152-V3; instruments require a minor hardware modification to work with the ROM, unless the mod has been previously installed along with the Version II ROM update. For the CZ-1 there is also a new ROM, part number 20101176, that fixes a "stuck note" problem in Multi Mode; no hardware modification is required. Either ROM is available through service centers *free* in single-piece quantities, but only until January 1, 1987, after which there will be a charge. If you need the ROM update, contact your service center *now*.

Recently, during a rehearsal, my CZ-101 fell off the top of an amplifier. The unit looked okay—the case wasn't cracked, and there weren't any signs of major damage—but it wouldn't come on. The local repair shop said that the adapter and audio cables had acted like little chisels and cracked the power supply board severely (I looked at it in the store and it was pretty trashed). Their estimate to repair the unit was $110. Isn't this too high? I only paid $225 for the unit.

The replacement board will cost the service center over $50, *including* the trade-in allowance for your old board, and not including shipping, handling, a long-distance call to place the order, etc. Add to this about an hour and a half of labor at $30/hr., and $110 seems about right. Repairs on highly integrated low-end devices are often labor-intensive, thus competing in price with new units sold at a discount. You might consider trading the damaged unit in on an older synth; the service center might be able the use it for parts, or rebuild it for use as a test bed for repairs or modifications.

> **"Either (CZ) ROM is available through service centers *free* in single-piece quantities, but only until January 1, 1987, after which there will be a charge"**

I couldn't get some of the MIDI functions on my new Polaris to work, and the MIDI would lock up occasionally. The dealer said I had obsolete software, and that the new software would cost $175. I was able to get a better deal on the new Rev 9 software from a service center, which solved my MIDI problems, but now when I play softly on the keyboard, nothing comes out. The service center says that Rev 9 has that bug in it, and they can't fix the problem until Fender provides new software. Then, I talked with another Polaris owner who said that Fender was providing the Rev 9 software free. Am I getting ripped off, or what?

I can't get the cassette interface on my Chroma Polaris to work reliably. I've tried several different cassette decks, including a

stereo component deck, but I often get only a partial load. Is there anything I can do to make it work?

As **EM** readers may be aware, Fender recently lowered the Polaris wholesale and retail prices substantially. This move was apparently related to their buy-out from CBS, and their desire to discontinue the keyboard line. Though the most recent software revision, Rev 9, was available at that time, Fender had a warehouse full of boxed units, ready to ship, that contained older Rev 5 ROMs. After the price reduction, the *retail* price of the unit was *lower* than the previous wholesale price, and Fender simply could not afford to unpack those units and upgrade the ROMs. Instead, they offered Rev 9 ROMs to late purchasers as an option/enhancement, to be installed at the owner's expense. To compensate owners who had purchased instruments prior to the price reduction, Fender made Rev 9 ROMs available to them free of charge.

Unfortunately, not all dealers and customers understood Fender's policies and intentions regarding the software. For the record, dealers and service centers may purchase the Rev 9 ROMs from Fender at an "A" discount; the suggested retail for the ROMs is $120. The installation time is under one hour. Owners of units purchased before the price reduction may obtain the ROMs and installation under warranty by presenting an Authorized Service Center with a valid warranty registration or proof of purchase.

Regarding the keyboard response problem, the Rev 9 software does provide a different response than Rev 5, and soft, legato playing will often not trigger the keyboard. Fender Service Manager Bill Thomas reports that at this time Fender does not consider this a "bug" or defect. In all fairness, the keyboard response with the Rev 9 software is no worse than that of many other controllers, and the whole issue of what constitutes a "good" keyboard response is largely subjective. Nonetheless, it seems ominous to me that all of the customers for whom I have installed Rev 9 software have returned their units for the re-installation of Rev 5; and all have cited the keyboard response as the source of their dissatisfaction. Thankfully, the Rev 5 software is fully functional. Rev 9 adds only the ability to transmit MIDI program changes without transmitting SYS EX program data, and improves the sync and cassette interface functions. Not all Rev 5 users report MIDI "lock up" problems. If you are presently using Rev 5 without difficulty, it may be wise to wait and see what resolution Fender might offer for the keyboard response dilemma, before purchasing Rev 9.

Concerning the cassette interface, almost any cassette data interface can be incredibly obstinate at times. Always use only certified data cassettes for data storage, *not* audio cassettes. For the Polaris, note that the software routines can be set up to send and/or receive at TTL and/or audio levels; refer to the "Cassette Interface" section of the owner's manual. When used with an audio cassette deck, the Polaris must be driven *hard* from the speaker/headphone output. I use a Sony TC-66 deck with the output volume *wide open*. Though Rev 9 does provide an improved cassette routine, there is a hardware modification that improves the Cassette Load function even more. This involves adding a 1k5 series resistor at the input, to isolate the cassette deck's output from loading effects. This is a *warranty update*; contact your local authorized service center for installation. Actually, in the shop and in the field I have virtually zero trouble with the stock Polaris cassette interface, though occasionally a factory tape will read reliably on only one side.

I am intrigued by Jack Orman's MIDI data tester idea in the August issue ("Making MIDI Spec Cables," page 46), but I don't see how this could work. The MIDI data pulses are only 32 microseconds long, which seems too short to keep the LED on long enough to be visible.

A *single* pulse would not be visible. But the MIDI data transmitted in response to note-intensive playing or continuous controller motion can literally "pack" the current loop with data pulses, one after another, rather like a 31.25 kHz square wave. This essentially multiplexes the "on" state of the LED, and at this rate, produces sufficient illumination.

Note that the current-limiting resistor in Orman's schematic can be safely omitted to increase the LED output. Also note that a high-brightness LED works best in this application.

I recently purchased a used minimoog. It works fine, except the pitch-bend wheel won't return to standard pitch. I replaced the pot, but this only helped a little. Also, I'd like to control the minimoog with MIDI—

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J.L. Cooper used to make a converter box, but it is no longer available.

When I use the pitch-bend lever on my OB-Xa, the instrument gets out of tune. The factory says there is a simple modification that will cure this. Is it something I can do myself? I'd also like to add MIDI to the OB; J.L. Cooper apparently used to manufacture an interface, do you know where I can get one?

Both instruments have similar problems and solutions. As the pitch-bend pots become worn, they won't return to the same resistance setting each time, which in turn affects the pitch-bend output voltage and thus the instrument tuning.

The minimoog described above is probably an older unit, and needs the so-called "dead-band mod" (two reverse-parallel diodes added to the pitch-bend circuit to provide a zero-voltage deadband at the center of the pot rotation). There are two versions of this mod, depending upon whether the minimoog contains a discrete- or IC-based oscillator card. Both mods are described in Factory Service Bulletin No. 830 (12/82), available from Moog Electronics at no charge.

The OB-Xa, in fact, already incorporates a diode-based deadband arrangement, but its pitch-bend circuit is somewhat more sensitive than that of the minimoog, and often requires one or two pairs of additional reverse-parallel diodes added in series with the existing parts. The diodes in question are located on the back of the Modulation Panel board, and are easily identified from the service manual.

Neither of these mods is especially difficult, but because of the sensitive nature of the affected circuitry, they are really suitable only for the *advanced* do-it-yourselfer. If you're not sure of your skill, have a technician perform the work instead. Either mod takes less than an hour, so the cost should be reasonable, and it's safer than risking damage to your synth.

J.L. Cooper Electronics previously manufactured the *MIDI CV Out* box, a device that allowed MIDI control of a monophonic CV/Gate-type synth, such as the minimoog (the Gate required conversion to S-Trigger format for use with the mini). They also manufactured the *MIDI Oberface*, a MIDI retrofit for the OB-Xa. Both of these units are now out of production. However, J.L. Cooper still manufactures the top-of-the-line *Midinterface I Out*, a multi-channel MIDI to CV converter, and has recently lowered the price on that unit ($550 retail); Roland offers the inexpensive *MPU-101*, a four-channel converter ($425 retail). Numera, a French electronics company, offers the *OB-Xa Midi Kit*, a full-featured MIDI retrofit for the OB-Xa. The Numera unit is one of the easiest-to-install MIDI retrofits, and requires no soldering, trace-cutting, or sheet metal work. Nonetheless, to order the *Midi Kit*, you must arrange to remit the current purchase price via an international bank draft drawn in French francs, at the current exchange rate. This whole process can become quite involved, so you may be better off having a competent service center order the retrofit for you, and pay them for the installation. As we went to press, the *Midi Kit* sold for 2500 ff, including shipping and handling. At the current exchange rate, you can expect to pay $400 or more for an installed unit.

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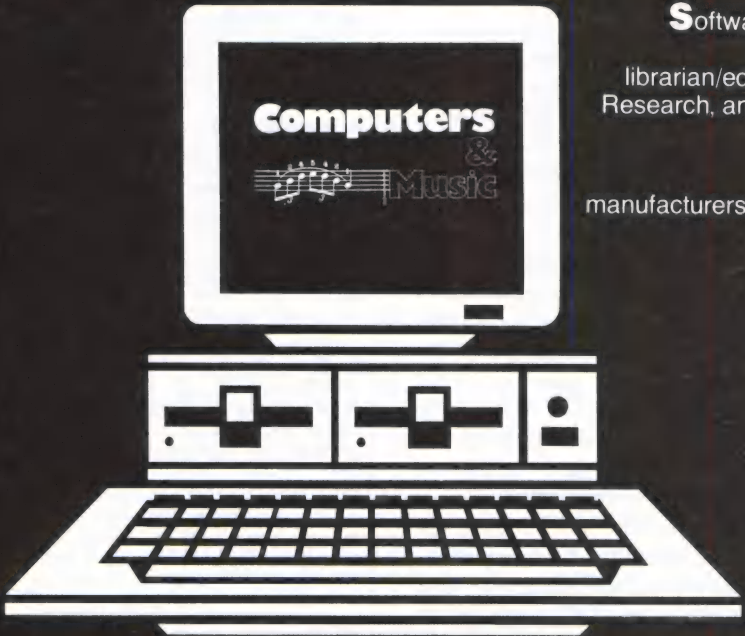

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Can a $65, consumer-oriented program stack up to pro music software? There are limitations—but also a surprise or two.

Hybrid Arts EZ-Track

BY PETER VINELLA

When I picked up my first copy of **EM** several months back, my primary goal was to find the perfect micro/software combination for my MIDI applications. After reading several reviews and ads, I decided on the Atari ST computer. To my delight, last summer Atari offered a complete 520 ST monochrome system—already MIDI-equipped—for the unbelievable price of $499. At that price, I couldn't refuse!

As with all new machines, though, the lack of software can often darken any original enthusiasm. Enter Hybrid Arts, a software vendor that offers a wide variety of products designed specifically for the ST—from voice librarians for the DX7 and CZ-101 to a SMPTE driven, 60-track multi-function sequencer. At the time, though, the only available sequencer was EZ-Track, a scaled down version of their MIDITrack ST sequencing program. Although I really needed their top-of-the-line sequencer, for the reasonable price of $65, I decided to give EZ-Track a shot.

JUST A FEW WORDS ABOUT THE ST

With its 68000 CPU (a 32 bit processor) and sampling/MIDI capabilities, the ST is a cost-effective machine that could be ideal for the serious and not-so-serious musician alike. Of course, its future success depends on the amount of support Atari gives the ST and the speed at which good software becomes available—the world of micros is tumultuous at best. Though most people would consider the ST an established computer, if you have any fears about the ST's future, the standard PCs (IBM clones and such) might be a more conservative choice. Let me also warn you that with new machines, operating systems and software, there are bound to be a lot of annoying bugs. But aside from the lack of adequate factory documentation and an operating system that is far too mouse-oriented, I truly like the ST and have a great deal of faith in its future.

NOW, TO EZ-TRACK...

Don't expect EZ-Track to answer all your sequencing needs; it wasn't designed to. However, even at its consumer-oriented level of sophistication, as a stand-alone product EZ-Track lacks some features I consider essential. It was simply designed to be a multi-track emulator. If all you need is a real time recorder with some small degree of editing, you might be

Software Shopping Tips

There are several "do's and don'ts" when buying software. These rules of course are not etched in stone, but unless you feel perfectly happy pulling out a debugger and hacking away, these rules can save you a lot of grief.

Buy from a retailer. Most software "houses" are actually one or two hackers in a garage. Although some great things have come out of garages (Apple comes to mind), the fact that a company has some distribution and can ship a product offers some hope that it can produce good software and won't just disappear overnight.

Run a demo of the program before you buy. Most retailers will only be too happy to let you noodle around with a software package, if only to learn more about it themselves. If you can't find the program, or the retailer is reluctant, demo disks are usually available directly from the manufacturer. It is extremely important that you get a feel for the program, its uses and features *before* you buy it. Far too often, the software won't live up to your expectations.

Read the documentation carefully before you buy. Although both the retailers and the manufacturers tend to be reluctant about handing out documentation, insist on this. Besides giving you more time than a store demonstration to study the program, the quality of documentation is often a good indicator of the quality of the software. Anyone who has ever tried to master a Yamaha RX-11 or QX-7 knows that even when the software is flawless, it can take months to learn all the features with inadequate documentation.

Try to avoid the first rev of a program. First releases have bugs (this is true for small companies and large companies alike). The very fact that a company can release a second rev shows that they care about their users and are likely to have enough resources to produce more updates in the future. Many software houses don't make it past the first rev.

Read all the reviews on the product that are available. I'm not just tooting my own horn here. Although reviews tend to be rather kind toward products in general, they are helpful in eliminating the obvious losers and offering some general insights into the program and its uses.

Peter Vinella has a PhD in Applied Math from Berkeley. He has been gigging in bands for 15 years (including work with PiL, Glenn Branca, and Neil Young), and currently plays in the band Necropolis of Love.

satisfied for a while; eventually, though, I think you would probably miss the lack of compositional features (such as musical notation and transcription). Don't think I'm totally down on the program, though—let me set *that* straight and say that Hybrid Arts did incorporate several nice features.

EZ-TRACK IS TRULY EASY

The program is very easy to learn and appeared to be bug-free. I felt comfortable using it after only a half hour or so of reading the manual and experimenting. To the user, EZ-Track itself appears as an extension of the ST's operating system. The program is mouse-driven and the menus are accessed in the standard ST fashion, which greatly accelerates the learning process. You can also bypass the mouse if you want to enter commands from the computer's keyboard.

The manual was easy to read (and even typeset) with many useful displays. I found it to be both helpful and straightforward; anyone who has struggled through English translations of Japanese manuals, or has received Xerox copies of dot matrix outputs, will find this quite a pleasant surprise. Although the display screens are not very extensive, they are designed in a clear and understandable fashion. My only complaints with them are that the metronome is a bit too small to see at a distance and the constant non-functional view of a multi-track icon gets very tiresome. Another good point is that with 20 independent tracks available, there isn't a need to merge tracks prematurely, which is often the case with dedicated systems. And the 27,000 note capacity on the 520 ST (63,000 on the 1040 ST) will be sufficient for most users.

HERE'S THE BEST...

The bookkeeping capabilities are EZ-Track's most appealing features. In general, these are handled in a very beautiful yet straightforward manner. At the song level, the entire piece can, of course, be given a title. But more impressively, the most recent date of an edit session and the version number are automatically updated each time the piece is appended or edited. Also, the memory available and memory used data for the entire song is conveniently displayed with a large bar graph. On the track level, the tracks can be individually named, activated, protected, and assigned MIDI channels. The track display presents, in a cramped but readable fashion, all the relevant information: track on/off, edit and protect flags, channel active indicator, the MIDI channel and the amount of memory used in that track. This part of the program was both very well thought out and implemented.

AND THERE'S MORE...

EZ-Track also offers several other programming features, such as a "step mode" in both playback and record. However, the method of entering the time value (decimal representation, such as 0.12, rather than the usual fractional form, 1/8) made this function rather cryptic. Velocity data, program (voice) changes, mod wheels data, and pedal information can be recorded in real time within the piece (although it doesn't seem to record aftertouch data). There is a MIDI Thru feature that allows the notes played on an external keyboard to mix with the output of EZ-Track on a selectable MIDI channel. This allows parts to be played along with EZ-Track, without being recorded and without the usual repatching. The tempo can be changed in the playback mode, but tempo changes within the piece itself are not available. EZ-Track can either act as the master clock or can be set to receive an external MIDI clock.

Track copy and merge functions are menu driven options, as are track-by-track time corrections. An eight octave transpose function, by half steps, is available, but this is implemented in a rather bizarre manner. Instead of transposing one track at a time, the entire song is transposed except for a selectable MIDI channel. A very useful design feature is the ability to reassign the MIDI channel of each track after it has been recorded. I only wish that the original channel was displayed rather than just the default (a blank).

BUT IS IT ENOUGH?

Despite all these good features, I feel that as a pure multi-track emulator, EZ-Track is limited. The "machine," unlike standard multi-tracks, is always in the record mode. Although each track can be individually protected, I found it problematic to set and reset the protection flags every time I wanted to test new material. What's more, you must set a flag in order to save any material you have recorded. It would make more sense to switch a channel into "record" mode, instead of protect the tracks over which you *don't* want to record, and add a quick erase feature for unwanted recordings. Also, as with most sequencers, only a single track can be recorded at any one time, although of course all the tracks are available for playback. A pause feature is included, but you can't simply stop and start again without the counter resetting to 0. I would prefer a fast forward and reverse feature to locate a specific part of the track and begin recording or playback at any desired location.

To me, the most annoying omissions were the absence of free measures to begin recording and the lack of a loop function—but then again, I must admit to a strong personal bias against tape recorder emulators. In fact, my main problem with EZ-Track is that it has some of the drawbacks found in "real" tape machines. The tape recorder was not designed with the musician in mind; it was made to record sounds in a purely sequential manner. Instead of trying to make EZ-Track more useful to the musician than a tape deck, Hybrid Arts—as well as several other companies—has fallen into the trap of simply copying a multi-track, which means incorporating the bad points as well as the good. For example, instead of displaying a measure counter, EZ-Track offers only a tape counter based on beats. There aren't any time signatures, measures, delimiters, or song pointers of any kind. (I don't know any musician who refers to a section of music as starting at the 1,009th beat.) Even with a PhD in math, I don't relish the idea of dividing the beat count by the beats-per-measure every time I want the measure count. Once the track has been recorded, you can't use any of the editing features that make digital sequencing so appealing. You cannot chain tracks, edit individual notes (either in pitch or time value), or time correct individual notes or subsets of the tracks. Adding dynamics, modulation, and tempo changes via a step mode is also not possible; there are no cut and paste functions, at the track level or song level. And like a true multi-track, when the channel is selected for record, the previous track material is erased. If you want to overdub on a track, you must record the material on another track and then merge the two tracks. Aside from only a small amount of available editing features, what you play is what you get.

AND NOW, THE SILVER LINING

As a stand-alone program, I found EZ-Track limited for serious musical applications. But used in conjunction with an additional system, I found that for a very small price, I could greatly increase the number of tracks and note capacity of my existing sequencer. In addition, I could take advantage of EZ-Track's wonderful bookkeeping system. By entering and editing the piece in a measure format on a QX-7, for example, and then bouncing the material over to EZ-Track, I could get the best of both systems. As editing is needed, the material could be bounced back to the QX-7. I had no trouble in transferring the data in real time, but a bulk MIDI transmission option on the EZ-Track would have been nice. I found that I could perform most of my needs except for individual note editing and transcription. To be sure, this is not the end-all solution. But comparing the price of the ST and EZ-Track with that of a comparable micro such as the Mac or XT along with a MIDI interface and software, this dual system is going to be very attractive to a lot of users who already own a sequencer.

THE NET RESULT...

Despite any disappointments with EZ-Track, I gained a lot of respect for the ST and Hybrid Arts in general. This program is easy to learn and use. And EZ-Track is a very powerful addition when used in conjunction with my existing system. If you want to buy the end-all micro/sequencer package, then the ST and EZ-Track aren't for you. But if you already have an existing system and are willing to wait for future software releases, then EZ-Track might help fill some of your short term needs. After talking with the people down at Hybrid Arts, I'm eagerly looking forward to their MIDITrack ST release in the very near future and I have great faith that given time, most, if not all of my major criticisms will be addressed.

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All keyboard controllers are not the same—and it takes some careful comparing if you want to choose the model that's just right for you.

Wersi M88 and Unique DBM MIDI Keyboard Controllers

BY ALAN GARY CAMPBELL

CONTROLLER BASICS

In the broadest sense, a MIDI controller translates body motion into data that can affect musical parameters on MIDI synths and effects devices. Piano/organ-keyboard-based controllers are by far the most common type. Many keyboard synthesizers are touted as capable MIDI controllers, but few actually live up to that claim. In general, controllers make no sound and must be evaluated on the basis of keyboard action, response delay, velocity curve, features, and ergonomics.

The *keyboard action* is often the most important consideration in selecting a controller. The action is a vital link in translating body motion and nuance into musical expression. Other shortcomings can be tolerated if the controller has a good action. However, no two players are likely to agree on just what a "good" action is. Some prefer a light action, others a heavy one; some like weighted keys, others unweighted, and so on. Nonetheless, most performers would agree that an action that is too light will not allow the highest degree of control over dynamics, and one that is too heavy or "stiff" will not allow the average player to execute rapid passages.

Response delay measures how quickly the controller's circuitry can generate and transmit Note On/Off data during performance. Depending upon the amount and type of data the controller must process (e.g., pitch bend, aftertouch, keyboard zone, sequencer data, etc.), there can be an audible delay between key-down and note-out, and this effect is often aggravated by additional response delays in external sound modules.

The *velocity curve* determines how the controller circuitry translates key motion into MIDI velocity values; this can have a major effect on the keyboard feel. Unfortunately, different manufacturers implement different velocity curves, and on most controllers the curve is not adjustable. This leads to many subtle incompatibilities between controllers and sound modules. For example: a controller often provides an apparently normal response from a slave unit over, say, the lower 75% of the playable velocity values, but the upper 25% have little or no effect *until* the keys are struck forcefully, at which point the slave unit "jumps" very unmusically to its highest amplitude/timbre value. Such incompatibilities explain why imitative timbres on samplers and digital pianos can sound very realistic when played from certain controllers, but very synthetic when played from others. The velocity response curve of the keyboard must be well-matched to the slave unit—often by trial and error—except in those rare cases where the sound module incorporates a velocity "map" to adjust the response.

Product Summaries

Product: Wersi M88
Type: MIDI Keyboard Controller
List Price: $1,100
Action: Weighted
Range: 88-note, C to A
Controllers: Sustain footswitch input, velocity
MIDI ports: Dual MIDI Outs
Manufacturer: Wersi Pro Line Division, Box 5318, Lancaster, PA 17601; tel. 800/233-3865.

Product: Unique Musical Products DBM
Type: MIDI Keyboard Controller
List Price: $1,199
Action: Unweighted
Range: 72-note, C to B
Controllers: Pitch bend, footswitch, pedal, wheel, aftertouch, and velocity
MIDI ports: MIDI In with merge, Thru, and dual Outs
Manufacturer: Unique Musical Products, 2031 S. Seneca, Wichita, KS 67213; tel. 316/264-5204

Controller *features* are also important. Most controllers are velocity-sensing, and incorporate mono aftertouch, performance controls, and sustain pedal and program change data transmission. Some also have split/stack/zone capabilities, onboard arpeggiators/sequencers, MIDI merge and filter capabilities, program change mapping, assignable controllers, poly aftertouch, and programmable setups.

Controller *ergonomics* refers to the physical size and shape of the controller, and the type and placement of the various performance controls, knobs, switches, displays, etc.—the human engineering. All these factors affect the performer's comfort and effectiveness in using the controller. Even the color and other aesthetic considerations are important, since an unattractive controller is likely to evoke a less-than-musical response! The ergonomic aspects of performance controls can be especially problematic. While some players prefer wheels, others prefer paddles, and still others prefer a joystick or the like, and the preferred performance control may not be incorporated with the desired keyboard action.

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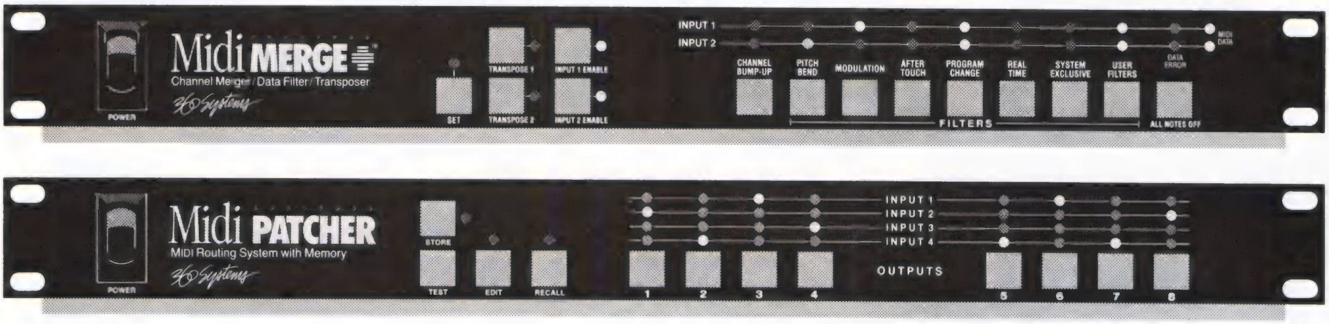
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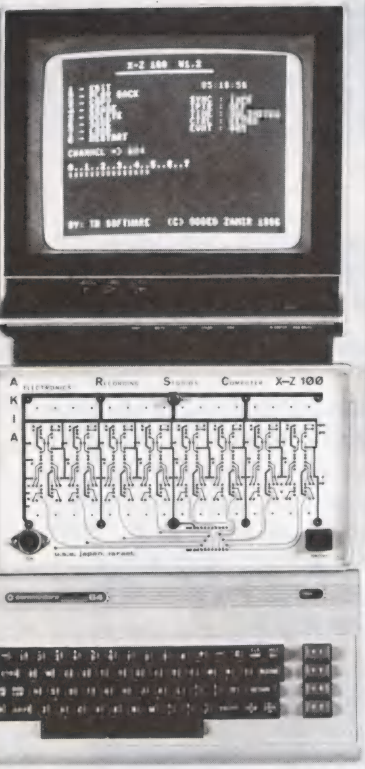

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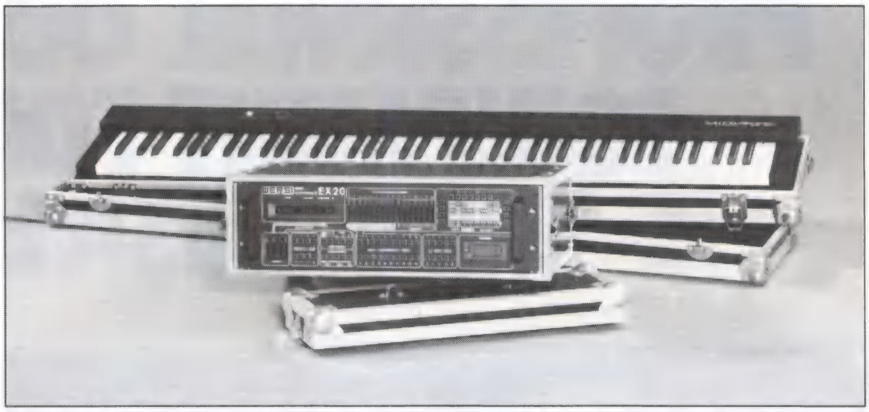

Wersi M-88 MIDI keyboard controller shown with the Wersi EX-20 MIDI Expander.

WERSI M88

The M88 is an 88-note, A to C, MIDI keyboard controller with a piano-like, velocity-sensing, weighted action. Aftertouch is not implemented. The unit comes in its own flight case, and when I say "in" I mean *in*: the bottom of the flight case *is* the bottom of the M88. Well, it's a low-parts-count design, at least! Actually, the assembly is quite sturdy, and measures, top off, only 4¼ × 52½ × 10½ inches (11 × 133 × 27 cm), which is barely larger than the keyboard action itself. The unit weighs just 45 pounds (20 kg) and is easily transported and set up by one person, making it ideal for gig use (no more strained muscles—hurray!). Smaller keyboard stands may not be able to accommodate the width, though. Power is supplied by an external 9 to 12 VDC adapter (provided). A power on/off switch and indicator LED are located on the rear panel—a minor inconvenience, since it can be hard to see the LED from playing position.

The action of the M88 is excellent—not too heavy nor too light. It is equal to or better than that of any controller on the market. Describing it as "piano-like" may be an understatement; the keyboard even looks like that of a piano, right down to the red felt strip along the back of the keytops—a nice touch. Response delay on the M88 is virtually undetectable.

The M88 transmits the full range of MIDI velocity values; the velocity is not adjustable. High velocity values can "overdrive" some sound modules (especially the Yamaha DX and TX synths), but the M88's action gives superb control of dynamics. When tested with a TX7, the M88 provided a wide dynamic range, but the TX would overdrive only when the M88 was played *hard*; notes would not "ring out" inadvertently.

The M88's features, though, are somewhat basic. Three switches along the top panel select a single split point, and set transpose intervals for the left and right split, respectively. The split function automatically raises the lower portion of the keyboard one octave, and lowers the upper portion one octave. The lower split transmits on MIDI channel 1 and the upper split on channel 2; the channel assignments cannot be changed. The low key for each side of the split may be transposed to any key value on the keyboard. It is possible to set a low split point and a high transpose value for the right-split, thus assigning nonexistent note numbers to the upper keys; in this case the M88 will "wrap-around" and repeat lower octaves to fill in the gap. Unfortunately, the M88 does not remember the split/transpose parameters when turned off, and setups are not programmable.

The M88 has no performance controls, and no provision for sending program change commands—an external module would be needed to implement these functions. The rear panel has a sustain pedal (footswitch) input. MIDI connections consist of two MIDI Outs, and both transmit the same data.

UNIQUE DBM

The DBM is a 72-note, C to B, MIDI keyboard controller incorporating an unweighted, velocity-sensing action, with aftertouch. It has extensive programmable features, including: multiple splits/zones, program change mapping, controller mapping, MIDI merge and filtering, and an onboard polyphonic sequencer.

The DBM is housed in an attractive, low-profile case, measuring approximately 39½ × 16 × 3 inches (100 × 40 × 8 cm), and weighing 33 lbs. (15 kg). The front panel contains a large alphanumeric LED display and an LED matrix, and various numeric data entry and control switches. Pitch and mod wheels are mounted in a comfortable position on the left side of the panel; the pitch wheel is spring-loaded, and both wheels have a good feel. The rear panel contains myriad jacks and controls, including: MIDI In, Thru, Out1, and Out2 jacks; Sequencer Sync In, Sync Out, Run, and Stop/Continue jacks; control pedal, footswitch, and program advance jacks; Tape/Sync In/Out jacks; a Metronome Out jack; memory protect switch; aftertouch sensitivity control; and a line fuse holder and AC cord receptacle.

A function-select-switch matrix accesses the programmable parameters. These parameter values are entered via a numeric keypad and/or increment/decrement switches. The matrix allows you to do "two-fisted" programming; it's a pretty fast method once you get used to it. Though you must access some parameters by number, parameter maps are silkscreened on the panel, for reference. The Owner's Manual is more than adequate, and written in an entertaining, conversational style.

The keyboard action is light and just a bit "springy." It has the definite attribute of being able to translate some side motion, so that palm glissandi or "smears" (a la Keith Emerson) can be performed without the sensation of running into an ebony brick wall! The keyboard response delay is barely detectable, even when the DBM is processing lots of data. It seems strange that the keyboard span stops at high B—one more note, "C," would complete the symmetry; but a look at the schematic reveals that this was an engineering compromise to allow the keyboard to be decoded by an 8 × 9 matrix. In any case, the DBM is only four keys shorter than a 76-note controller, and for most applications requiring a six-octave keyboard, this shouldn't make much difference.

The aftertouch is sensitive, but controllable—an improvement over most keyboards—and aftertouch data can be mapped to pretend that it's pitch bend (or mod wheel) data. Yes, you really can split the keyboard and play bass with one hand and a pitch-bent lead line with the other; but it can be a bit tricky to adjust

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the aftertouch sensitivity so that the force of playing chords doesn't inadvertently activate the bend. Also, on the DBM we were provided for review, the aftertouch was very unresponsive in the upper two octaves of the keyboard. Bob Wiley, Director of Marketing for Unique, reports that the aftertouch mechanism can be affected if any uneven force is applied to bottom of the instrument case. The problem was solved by placing the unit on a level tabletop, with all four of the DBM's rubber feet firmly supported. However, this seems a point of concern, especially in a live performance situation, since some keyboard stands may require the addition of a shelf of some kind to provide such support. Nonetheless, the aftertouch is too good not to use.

The keyboard velocity and aftertouch curves are adjustable and programmable—a real plus; the aftertouch also has a non-programmable sensitivity control. However, on the unit tested, a few keys were considerably more sensitive than the rest, resulting in notes that would "ring out." Fixing this requires a mechanical adjustment performed by the factory or a service center, as the velocity adjustment affects only the overall output. To be fair, the unit we received for review was an early production model, and might be expected to have a few misadjustments.

The DBM keyboard can be divided into three zones: *left, center,* and *right*; each can have its own MIDI channel assignment and program change number. Zones can overlap, and be independently transposed. The center zone can be coupled with the right or left zone, or disabled. A non-programmable transpose switch can shift the range of the entire keyboard downward one to two octaves.

MIDI controllers (pitch bend, footswitch, pedal, wheel, and aftertouch) can be assigned independently to each zone. The wheel, footswitch, and pedal can be transmitted as any applicable MIDI controller number.

The DBM can enable/disable transmission on any MIDI channel, independent of other progam parameters, to avoid inadvertent transmission on "reserved" channels. Active channels are indicated via the LED matrix. Any or all MIDI channels may be enabled/disabled for either MIDI Out, or either Out may be disabled. The DBM can also send Omni On/Off commands on any or all channels. Secondary program change commands can be sent on any or all channels. These features, taken as a whole, offer program-change mapping capabilities commonly found only on dedicated MIDI processors. For example: the DBM can send separate program change commands to different slave units receiving on the same channel, or send program change commands to synths that are under local control (i.e., not played by the DBM keyboard or sequencer).

The MIDI Input can merge data appearing on a user-specified channel, and selectively filter pitch bend, mod wheel, aftertouch, program change, sustain pedal, and Omni On/Off data.

> **"Many keyboard synthesizers are touted as capable MIDI controllers, but few actually live up to that claim"**

All DBM parameters (except global transpose and aftertouch sensitivity) are programmable. Up to 64 programs may be stored, and programs can be duplicated or exchanged between locations, with a single command. Program sets may be loaded/saved via cassette or MIDI; cassette dumps can contain program or sequence data, or both. A dedicated footswitch input is provided for the Program Advance function.

The sequencer records up to 4000 notes on four polyphonic tracks, in real time or step mode. Available time signatures include 4/4 and 3/4 only, which is rather limiting. An LED indicator and an audible internal metronome (which may be disabled) provide a timing reference with a two-bar "count-off." A sequence is first recorded on track one, then, if necessary, bounced to another track. The length of the sequence on track one determines the sequence length for other tracks. The length can be preset in beats per sequence, or computed automatically from the length of the first sequence recorded. Autocorrect values from quarter-note to 32nd-note resolution may be used to quantize a sequence *during recording* (a "free" mode provides a maximum resolution of 96 pulses-per-quarter note); in step mode the autocorrect value sets the step duration. Sequences record all the MIDI data generated by the controller, including pitch bend, aftertouch, program change, etc. You can use the increment/decrement keys to fast-forward/rewind in a sequence, but there's no punch-in/out; "flubbed" sequences must be erased and re-recorded.

Various housekeeping functions copy, erase, chain, and loop sequences. The sequencer can be synchronized to an internal clock, or set up to send/receive MIDI clock, external pulse-based clock, or tape sync codes. During playback, each track can have its own MIDI channel assignment. The sequencer output can be transmitted in addition to any MIDI data generated in real time by the keyboard and controllers (it's amazing how much music one person can make with a controller like this). Really, the sequencer is not so much short on features as on *memory*—four complex keyboard tracks can use up most of the 4000-note capacity in just one song. The sequencer seems best-suited for bass lines and "comps" for live performance.

CONCLUSIONS

The M88 is by far the most transportable 88-note controller available, with an excellent keyboard action. Its features are rather basic, but users requiring performance controls, etc. can purchase an external module providing these functions, and other users might simply enjoy the reduced cost!

The DBM, in comparison, has a somewhat shorter keyboard than most extended-range controllers, but is jam-packed with features, including multiple performance controls and an onboard sequencer. The finicky aftertouch is something you can probably live with, if you like the keyboard in general.

Either controller represents an excellent value, and it's likely that most keyboard players would be quite happy with one of the two. **EM**

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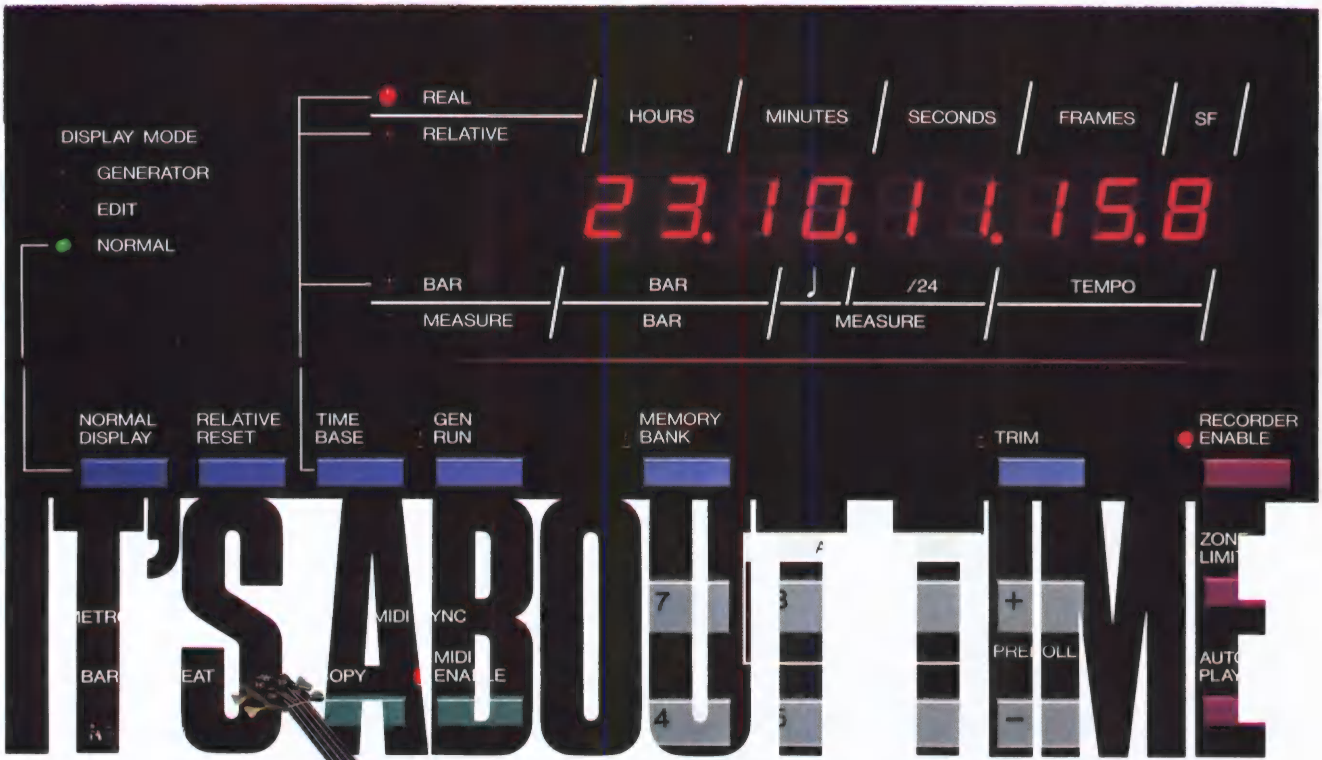
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Another electric piano sound module? Well, maybe. . .but it sure does a whole lot more than just sound like a piano.

Kurzweil K150 Rack-Mount MIDI Sound Module

BY ALAN GARY CAMPBELL

The K150, Kurzweil's long-awaited rack-mount spinoff of their original K250 keyboard, is a 16-oscillator, multi-timbral digital "sound module" incorporating a comprehensive MIDI implementation. The K150 is not a sampler; sounds are stored in ROM and used for replay only, which you access from a remote MIDI controller (not provided). However, the sounds can be modified to some extent, and an update is planned to provide additive synthesis capabilities.

The K150 is housed in a quad-height (7-inch; 18 cm) rack enclosure, measuring 15-¼-inches (39 cm) deep. The front panel contains double data entry keypads, a large alphanumeric LED display, power switch, volume control, and a stereo headphone jack. The rear panel includes an unbalanced line-level audio output; a pedal (footswitch) input; the Cassette Input and Output; MIDI In, Out, and Thru jacks; and the line cord receptacle and fuseholder. There's also a rear-mounted cooling fan; judging from the vent slots provided, the K150 should be mounted in a well-ventilated rack enclosure.

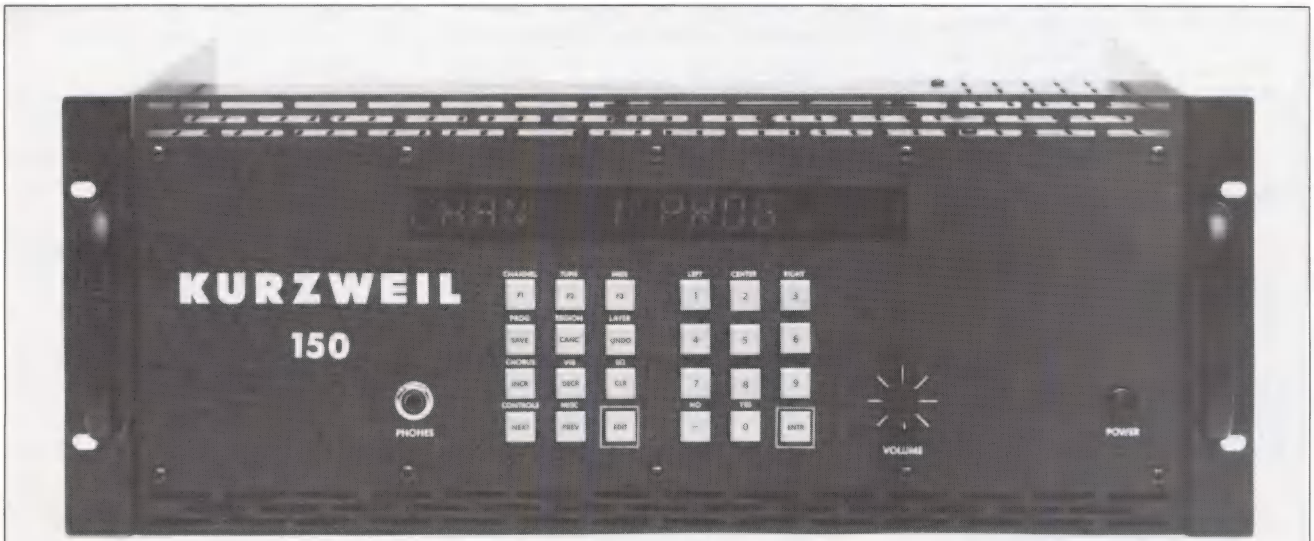
Product Summary

Product: K150 MIDI Sound Module
Type: Rack-mount expander module, playback only
List Price: $2,995
Number of oscillators: 16
MIDI implementation: Multi-timbral
Voices: 14 resident voices; optional eight-voice "sound blocks"
Planned accessory software: Additive synthesis using Macintosh computer
Manufacturer: Kurzweil Music Systems, 411 Waverly Oaks Road, Waltham, MA 02154; tel. 617/893-5900.

***Alan Gary Campbell** is owner of Musitech,™ a consulting firm specializing in electronic music product design.*

The keypads access many of the K150's parameters directly, which makes programming fairly intuitive. The alpha display helps here by providing prompts, mostly in English (the lack of computerese is refreshing). For performance use, the display is large enough to be read at a distance. The K150 Owner's Manual is thorough, but not very effectively indexed; it's hard to locate specific references without hunting through the manual page-by-page. The copy received for review also did not contain listings of the voices and programs.

A "voice," in Kurzweil terminology, is a "computer model of an acoustically rich instrumental sound" stored in ROM. The K150 comes with 14 *resident* voices, including three acoustic and two electric pianos, two harpsicords, acoustic bass, two electric basses, vibes, marimba, and



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jazz and rock organs. Additional voices may be added in ROMs called *Sound Blocks*. An eight-voice Sound Block is included that contains three guitars, four synth sounds, and congas.

The K150 acoustic piano sound is incredibly accurate; it is very similar to the acoustic piano timbre of the K250. It even simulates the sympathetic vibration of the undamped treble strings—how *do* they do that? The K150 voice-assignment routine is rather forgiving of long arpeggios with the sustain pedal down, and it often sounds as if there are more than 16 oscillators available. However, striking a key repeatedly with the pedal down can truncate the envelope decay segment as oscillators are reassigned, and notes will occasionally "ring out" (i.e. a note will be uncontrollably too loud, or bright and the decay will be too long). The effectiveness of the piano voice depends to a large extent upon the player's technique and his or her comprehension of the unit's limitations, as well as the amplification and equalization used.

The quality of the other voices ranges from excellent to average. The acoustic bass and nylon string guitar are very good; vibes and marimba are noteworthy, too. The Rhodes voice is excellent. Most of the organ and synth voices, however, are more pedestrian.

Conspicuously absent are the Kurzweil string sounds. Pam Marshall, Software Designer for Kurzweil, and programmer of the K150 voices, reports that the K150 sounds employ an additive synthesis process, rather than the sampling techniques used in the K250 (though Kurzweil refers to both processes as *Contoured Sound Modeling*), and that ensemble voices have not as yet been developed for the K150. Other Sound Blocks are in the works, however, and reportedly include a variety of contemporary and traditional timbres—and a trap set to go with those congas!

A planned optional update, *Sound Lab*, will allow users to create voices using additive synthesis routines on a personal computer, and then download these voices to the K150 via MIDI. Judging from the quality of the factory sounds, additive synthesis on the K150 will be tremendous.

Voices can be combined with various control parameters to form *layers*. Each layer can have independent control over tuning, transposition, chorus enable, vibrato enable, EQ enable, and *Timbre Shift*. Timbre Shift replaces the spectrum of a given note with that of a higher or lower note—which produces a sound that's analogous to that of a sample transposed above or below its normal range, but without the attendant pitch shift. The degree of timbre shift can be fixed, or controlled by MIDI attack velocity or an assignable controller. Timbre Shift can produce some interesting sounds, but it's the only timbral-control method provided—there are no amplitude envelopes, VCFs, or the like.

Layers can be combined to form *regions* (commonly referred to as keyboard "zones"). Combinations of voice, layer, and region parameters can be stored as *programs*. The unit retains up to 256 programs, and comes with 76 preset programs that can be overwritten, or recalled at any time—kudos for this. Various mapping functions determine how MIDI program change numbers access the programs, and arbitrary maps can be created. The K150 can theoretically load/save programs via cassette or MIDI, but these features were not implemented in the unit provided for review.

The K150 is fully multi-timbral. In Multi mode, each MIDI channel may be assigned to a different program. As many as 16 monophonic lines (one per oscillator), or various combinations of monophonic and polyphonic lines may be played, each with a different timbre, with the restriction that the instantaneous polyphony cannot exceed the K150's 16-oscillator limit. Programs utilizing more than one oscillator per note will reduce the available polyphony; however, the K150 provides dynamic voice allocation so that temporarily inactive channels do not waste available voices.

Program parameters also include global adjustments for the chorus, vibrato, and equalizer. *Chorus* stacks up to seven voices on a given key, with programmable amounts of delay, detune, and amplitude decay applied to each successive voice—like a MIDI delay unit. This can use up voices rather quickly, but creates a fat, animated sound. Interestingly, the K150's voice assignment routine will "steal" chorus-assigned voices temporarily when greater polyphony is required.

The chorus function can create effects ranging from flanging and echo to octave doubling and chromatic glissandi. Chorus depth can be fixed or controlled by mod wheel or aftertouch.

Vibrato includes the common modulation rate, depth, and delay parameters; but, the familiar triangle and square waves are provided with complete control of waveform phase, offset, and symmetry. Various arbitrary ramp and pulse waves can be produced. Vibrato parameters are global, but the K150 does respond to polyphonic aftertouch, so that different vibrato *amounts* can be applied to each key when the K150 is driven from a controller incorporating this feature.

The *Equalizer* function digitally simulates an 8-band graphic EQ with band centers at 62.5, 125, 250, and 500 Hz, and 1, 2, 4, and 8 kHz. Up to 12 dB of boost and 30 dB of cut is available per band. The 62.5 Hz and 8 kHz bands are shelving controls (i.e. they boost frequencies below the 62.5 Hz and above the 8 kHz band centers respectively); the others are peaking controls.

The K150 also provides other mapping functions, in addition to program change mapping. Poly aftertouch can be mapped to provide polyphonic touch-sensitive pitch bend. A keyboard velocity map can be programmed to adjust the K150's response curve to match various controllers. (Several controllers tested with the K150 were not compatible with its pre-programmed curves, so you may have to spend some time "tweaking" this function to obtain the best response.) The K150 can even be adjusted to play with alternate intonation (e.g., Just or Mean Tone tuning).

Given the factory programs provided, the K150 is likely to be viewed as "another rack-mount piano," an unfortunate over-simplification. Its multi-timbral capability and promised additive synthesis set it apart from the rest; though, from the piano-module perspective alone, its performance is easily commensurate with its price. Perhaps a 16-oscillator sound module can't obviate a piano in many jazz and classical performance contexts, but it's still a pretty amazing piece of hardware.

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Does the world really need another synthesizer? Well, when it's an inexpensive keyboard that sounds good, is easy to program, and even has a support software package from Hybrid Arts, that question is pretty easy to answer.

The Kawai Keyboard System

(K3, K3m Rack, and Hybrid Arts Editing Software)

BY JAN PAUL MOORHEAD

There are significant changes afoot in the world of synthesis. Lower memory costs are not only increasing the quantity of features and power, but also leading to major qualitative changes. What we're seeing is a new line in hybrid keyboards, and the Kawai K3 is a great example of this new breed.

So, what's the big deal? You got your oscillators, your filters and envelopes ...so what? The difference is in the *oscillators themselves.* In the analog, two oscillator synth, there are typically six (or fewer) available waveforms: pulse, sawtooth up, sawtooth down, sine, triangle, and random (noise). Usually you also have a variable pulse wave. Varying the timbre of these basic waveforms involves filtering out parts of the sound you don't want—a technique called *subtractive* synthesis. *Additive* synthesis requires that you stack simple waveforms into complex sounds. (For more information on the different types of synthesis, see "Electronic Tone Synthesis" by Robert Carr in the November '86 issue.) Early additive synthesis methods were expensive, and liable to cause brain damage in anyone who didn't swear an oath to make programming this type of synthesis life's only goal; although more recent additive designs don't exactly make the process simple, they do make it a lot easier. Now, through the use of digital technology, manufacturers are combining both types of synthesis—subtractive and additive—into a new family of hybrid instruments.

The decreasing cost of memory is what makes all this possible. The waveforms in the K3 are produced not by hard-wired devices, but are mathematical descriptions of sounds stored in memory. This approach gives us better, and less expensive, sound sources.

PHYSICAL DESCRIPTION

The K3 is cleanly laid out in an official high-tech burnished gray case, and features a large—hence easy-to-read—LED display (the display is strictly numeric, though, so cute names for the voices are out of the picture). The body is solidly built and made of metal. However, the end pieces of the keyboard are plastic, and one K3 that I saw taken out of the box looked as though the end piece had

Kawai K3 synthesizer, Atari computer, Hybrid Arts interface and software.

***Jan Paul Moorhead** works in the Los Angeles area as a freelance musician, instructor in commercial music at Long Beach City College, computer consultant, and as owner /operator of Pulse Music, a 16-track MIDI/ SMPTE-based production studio.*

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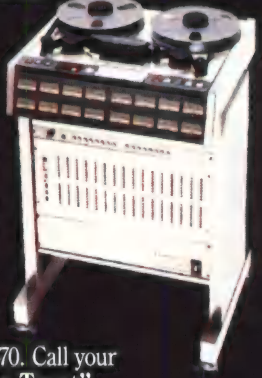

So if synthesizers with MIDI, or SMPTE with film and video, is part of your business, check the specs and don't settle for less than the MX-70. Call your nearest Otari dealer for **"Technology You Can Trust".**

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been air dropped, into Long Beach during rush hour, without a parachute. It's too bad the end pieces aren't as sturdy as the rest of the package, but overall the K3 is well-constructed...just don't drop-kick it.

The machine is so easy to understand (it makes a great learning machine) that it was quite a while before I felt any need to actually read the manual. I was in for a pleasant surprise. As a veteran of hundreds of manuals, I've been firmly of the opinion that there is no such thing as a good manual, just those that are less offensive than most. The K3 manual is one of the best written that I have ever encountered. It functions well as a tutorial for each operation and as a reference manual. My only recommendation would be an index.

The front panel membrane switches double as programming switches and patch selection switches. The K3 holds 50 patches internally and 50 on cartridge. This is quite a bunch to have immediately available. The factory sounds include very good strings, electric piano, organ, bells, and flute, some respectable brass, and the obligatory sound effects (including the ever-popular helicopter noise). The sounds are listed on a nifty little plastic card that fits nicely in an indentation to the right of the switches. If you do a lot of programming the factory patch listing quickly becomes pointless, of course, but on the flip side is a list of the digital waveforms available in the machine. The card shows a graphic representation of the waveform and thus makes a dandy programming aid when you've outgrown the factory patches.

The keyboard has an excellent feel for a machine in its price range. Kawai has been building excellent acoustic pianos for some time and they obviously applied their expertise in this area. The K3 is a six-voice synth and, though many manufacturers seem to think that is all we should need, I find six voices to be an irritating limitation; fortunately, the K3m module covered below offers a solution to that problem.

Velocity sensing and aftertouch are included, but also, the aftertouch has a very nice feature that is rarely found: you can control the overall volume through aftertouch—not just volume modulation (tremolo), but the actual level of the VCA. This allows for swells and decrescendos without a volume pedal. Using aftertouch for these effects feels very natural and is an elegant solution to the problem of expression on synthesizers.

Product Summaries

Product: Kawai K3 Digital Wave Memory Synthesizer
List Price: $1,249
Sound production: 33 digital waveforms (including pink noise and user definable waveform) assignable to either of two digital oscillators, six voice polyphonic
Keyboard: 5 octave, 61 keys, velocity sensitive and aftertouch
Memory: 50 patches internally, 50 on cartridge
Other features: High and low pass filters, 7 LFO waveforms, stereo chorus (two outputs) and slapback effects, separate envelope generators for VCA and VCF
Manufacturer: Kawai America Corporation, 24200 So. Vermont Ave., P.O. Box 0438, Harbor City, CA 90710; tel. 213/534-2350.

Product: Kawai K3m Synthesizer Module
List Price: $849
Description: Rack-mounted K3; includes all K3 features except keyboard
Extra Features: In conjunction with the K3, the K3m allows the K3 to have splits or function as a 12 voice synth
Manufacturer: Kawai America Corporation, 24200 So. Vermont Ave., P.O. Box 0438, Harbor City, CA 90710; tel. 213/534-2350.

Product: K3 Wave Table Editor Software
Price: $149.49 for software, $199.95 for interface
Type: Editor and Librarian
Hardware requirements: Atari 800, 800XL, 130XE, or other Atari 8-bit computer; Hybrid Arts Interface
Manufacturer: Hybrid Arts Inc., 11920 West Olympic Blvd., Los Angeles, CA 90064; tel. 213/826-3777.

Data entry is done by a data wheel, located towards the left of the unit in the vicinity of the volume slider and pitch bend wheel. Pitch bending can be set to an octave up and down. Some may be dismayed by the lack of a modulation wheel on the keyboard, but that's taken care of in a unique way. When you save a voice into memory or onto cartridge, the machine remembers the last parameter you edited. Whenever you move the data wheel, that last parameter is immediately in edit mode. Thus, the data entry wheel becomes your modulation wheel or octave wheel or resonance wheel or whatever—you can pick *any voice parameter* as a live performance function. In a limited way, this allows some of the flexibility that was available on synths before the advent of membrane switching. Of course, if your performance style demands that the modulation wheel and pitch wheel be side by side, you're out of luck; but Kawai's approach does offer some advantages not found with traditional synth design.

K3 SYNTHESIS

Kawai's new hybrid system provides several options. First, you start with 32 waveforms in memory. In addition to sawtooth, sine, and square waves, the oscillators can produce very complex waveforms that are emulations of natural sounds. These are not samples, but digital re-creations of real sounds. The great value of these has not so much to do with whether or not they sound exactly like acoustic instruments (though some of the simulations are quite good), but in the rich harmonic material you have to play with when you begin to shape the sounds.

Secondly, and this is a very important feature, you can build your own waveforms. Thirty-two harmonics can be used at one time out of a total palette of 128. Once you have created a new waveform you still have the standard filters, envelopes, detuning, oscillator blending etc. available to further modify your sound. The tools Kawai gives you are simple to operate and clearly documented. The K3 lets you specify a range of harmonics rising or descending in value, or to erase block areas of the harmonics. This type of digital waveform creation is a very powerful tool, and the K3 has a lot more sophistication than the first set of factory patches might lead you to believe.

There are a few minor drawbacks. One is that when you are creating a waveform, you must be in the patch number in which you want the waveform stored. If you aren't, and you elect to change patch numbers, you lose your new waveform when attempting to store it in the new location. (This applies only to waveform creation, not normal patch editing.) The second catch is that not many users will know, for example, about the value of each harmonic in the sound of a harpsichord to be able to recreate it. I think most people will discover sounds rather than design them, but what's wrong with that anyway? One other small annoyance is that you can't directly listen to a waveform as you create it; you have to punch a button and let the K3 recalculate it for you first. This doesn't take too much time, but I always prefer playing to pushing buttons.

When it comes to MIDI, the K3 has all 16 channels available for send and receive. You can choose between five levels of MIDI receive, which provides some very specific filtering capability. The system exclusive implementation can send and receive waveform data, as well as program data, through MIDI. In the most recent update, you also have local on and off so that you can play another synth without the K3 producing sound from the keyboard. This makes it easy to use the K3 as a master controller.

Overall, the K3 is an excellent synth for the money. The ease of programming and the clarity of the documentation make it easy to get along with. If I need to come up with a sound in a hurry, it's one of the synths that I'm most likely to use. Its interior design makes possible good bell and chime type sounds as well the fat sounds usually associated with strictly analog synths. As far as I'm concerned, the K3 makes an excellent contribution to anyone's MIDI system.

THE K3m (KAWAI K3 MODULE)

The K3m module has some features that set it a notch above many of the other modules on the market. For instance, all the programming can be done from the front panel and there is no need to buy a separate programmer. With the exception of two switches, the K3m perfectly duplicates the front panel of the K3. It allows two extra functions in conjunction with the K3. One is spillover (MIDI overflow); whenever you play more than six voices on the K3, the extra voices go to the K3m, thus providing up to 12 voices. The other function is splits. You can define split points on the K3 and assign the K3m to the top or bottom. (Note that the splits and spillover features require a later version ROM. You can find out which you have on the K3 by checking your master function switch. If you have six levels of functions instead of five, then you need to get a ROM update.)

HYBRID ARTS K3 WAVE TABLE EDITOR SYSTEM

This software package, for Atari 8-bit computers such as the 800XL and 130XE, is a patch librarian, patch editor, and waveform editor for the K3. It has a simple but impressive color effect that rolls up from the bottom of the screen when you first boot into the program (this display can be disabled). The initial menu is clear and effective; I'd like to see a sim-

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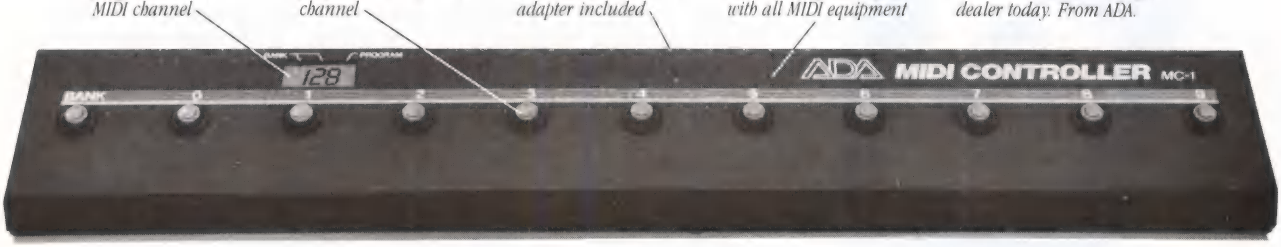
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plified version of the menu carried over into the other screens.

With certain exceptions you can jump from one module of the program to another without returning to the main menu. This is a timesaving feature, and deserves to be more consistently applied across the program.

The librarian module will load and save banks of patches but doesn't allow organizing patches within a bank. This is an important function that I wish had been included. To assemble the most useful patches into one bank, you have to transfer patches back and forth from the K3. This is not mentioned or explained in the documentation.

The patch editor works well, but would probably be easier to use if the windows and array of the functions followed the arrangement and logic of the K3's front panel. One excellent feature is that the patch editor is immediately interactive with the K3—you do not have to make a change and then send it, make a change and then send it, ad infinitum as with some editors. I did find a couple of program glitches in this module. One is that the values for programming parameters that could be negative or positive kept reading into the program from the K3 as negative whether they were negative or positive. The other was that the space bar did not perform as described in the manual; it was supposed to jump to the previous screen but in actuality would always take you back to one screen in particular. I talked to the people at Hybrid Arts, and they will be taking care of these minor problems.

The directory functions work satisfactorily but seem quite slow in some areas. . . though this could be my IBM and hard disk prejudice showing through. (Ever notice that the longer you own a computer, the slower it gets?—Ed.)

The heart of the program, the waveform creation module, is the most important element. The ability to see the relative value of the harmonics at a glance is extremely valuable. To enhance the visual recognition factor, I would prefer that the harmonics be labeled with their relationship to the natural overtone series. You can see the number of the harmonic you are currently changing but not all of them at once. In all fairness, it might be difficult to fit all 128 labels on one screen, but hey, I want everything, and I want it now, all right?!

CONCLUSIONS

The program works quite well and does what it claims; in particular, the waveform editing has some distinct advantages over doing it on the K3. If you expect to buy more than three cartridges for the K3 and you have an Atari computer and interface, the software will quickly pay for itself. If the idea of laying out the money for a computer, interface, and software doesn't exactly fill your heart with joy, don't worry—the K3 is easy enough to program, the cartridges are inexpensive, and they do hold 50 programs each. (By the way, if you're in the market for the Hybrid Arts Sequencer, Kawai offers a package deal with the computer, disk drive, interface, sequencer, and K3 editor software for $895.)

If you're just getting into synthesis, the K3 is a great place to start. If you're a seasoned veteran, the K3m module will give you a bunch of new and useful sounds at a relatively low cost. Kawai may be a new name in the field of synthesizers, but they have made an impressive debut.

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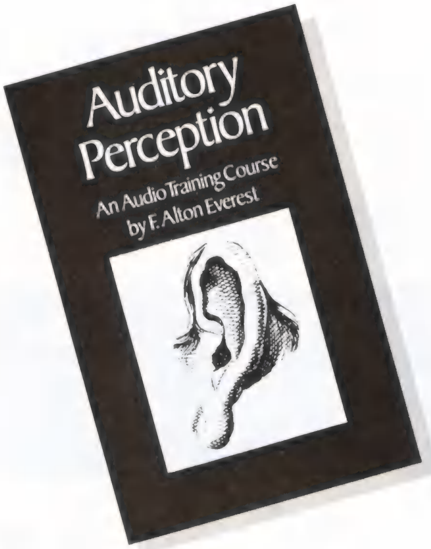

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Thanks to a software update, ART's DR1 joins the world of MIDI performance control. But is this just a gimmick, or does it truly open up new musical possibilities?

ART DR1 Performance MIDI Reverb

BY JIM FIORE

A little over a year ago ART introduced their flagship digital reverb unit, the DR1. Facing some rather stiff competition at the outset, its smooth, sweet sound and convenient remote control soon earned it a place in the hearts of users. ART was not content with this, though, and has recently introduced an updated unit, the DR1 Performance MIDI. This addition places the DR1 well ahead of its rivals and into the realm of the Lexicon PCM70 (at a substantially lower price!). Those who already own a DR1 with 1.0 software can update to Performance MIDI with a Version 1.2 system chip for $50.

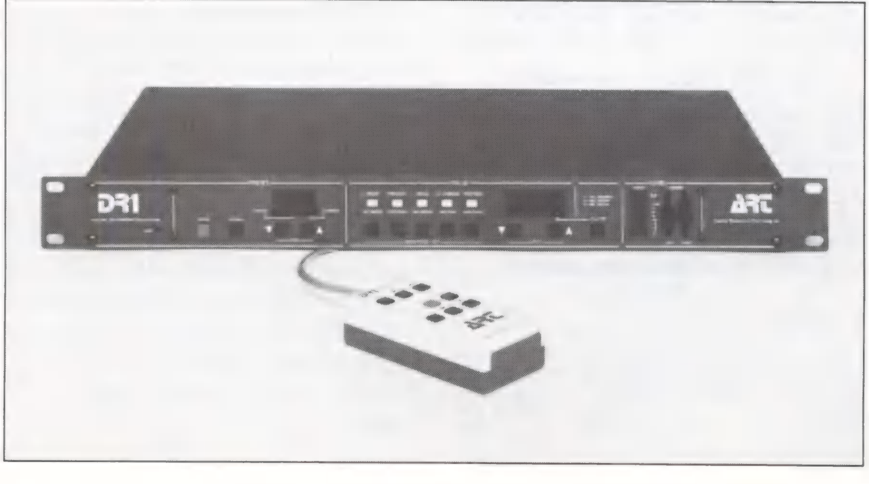
Although this review focuses on the Performance MIDI features, let's first take a quick look at the DR1's basic capabilities. The DR1 is a stereo device whose inputs are switchable between line and instrument level. The input signal stereo separation is maintained at the output for dry signals, but the two inputs are combined when generating a stereo reverb signal. This is much nicer than a simple mono reverb output; unfortunately you can't use the DR1 as a dual mono reverb. A full function remote accesses all of the front panel controls (except for the wet/dry mix and the write protect for the 100 user presets; the 40 factory presets cannot be overwritten).

> **"We're talking about the ability to do some fairly weird things"**

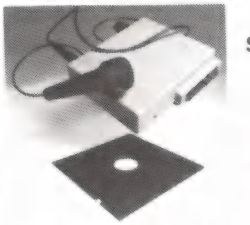
REVERB AND EFFECTS PROGRAMS

The DR1 contains 15 traditional reverb programs: five Plate, five Room, and five Hall. Each program contains different algorithms with different characteristics. In addition to these 15, there are six special effects programs that include DDL, Gated Reverb, Reverse, Flange/Chorus, and appropriately two programs simply labeled as special effect 1 and 2.

Effect 1 creates larger-than-life reverbs, such as caverns and canyons. Effect 2 produces drones and step type "percussive flanges." The Flange/Chorus program generates more traditional flanging and chorusing sounds, and allows for control over the typical parameters such as sweep rate and sweep width. The Gated program produces the characteristic "hyper-ambient" sound with fast cutoff. The DDL features control over the left and right delay times, high frequency damping, regeneration, and feedback path length. With a maximum of one second of delay and all this flexibility, you can easily make delays not possible with normal delay units. Also, several of these programs may be set for left/right



When not pretending that he's an associate professor in the Electrical Engineering Technology curriculum at Mohawk Valley Community College in Utica, NY, ***Mr. Fiore*** *operates Dissidents Audio Consulting. His interests include: several musical instruments; making snide comments about lawyers, realtors, and politicians; plotting the overthrow of major governments; doing Bill the Cat imitations; and avoiding paternity suits.*



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tracking for use with Performance MIDI (during real time this alters left or right parameters to correspond to changes made in the other channel).

User-controlled parameters include Predelay, Reverb Time, High Frequency Damping, Position, Diffusion, and Minimum Decay. (For more information on digital reverbs in general, see "Sing a Song of Reverb" by Larry Oppenheimer in the February and March 1986 issues of **EM**.)

✓ *Predelay* sets the amount of time the reverb signal is delayed before being combined with the dry signal. Simulation of larger acoustic spaces tends to require longer predelays. This ranges from 0 to 200 milliseconds in the DR1.

✓ *Reverb Time* also has a rather wide adjustment range of 0.1 to 25 seconds.

✓ *High Frequency Damping* controls a room's "brightness." However, this is not quite the same thing as simply equalizing the reverb return, as you are simulating the effect of absorptive materials in the room.

✓ *Position* simulates where you are standing in relation to the sound source, from right next to it to way across the room.

✓ *Diffusion* determines the density of the reverb signal and the complexity of the acoustic space.

✓ *Minimum decay* is a rather interesting parameter; usually it is set to the same value as the reverb time. If it is a lower value the result will be what ART calls a dynamic room which means the reverb time becomes shorter when processing busier sections of music. Also, one of three "K/I" modes (reverb kill, infinite sustain, and a special decay kill which leaves only the early reflections) can be accessed via the front panel control, the remote, or a footswitch (not supplied).

PERFORMANCE MIDI

And now for the good stuff! First, the DR1 can communicate on any of the 16 MIDI channels in either Mode 1 or Mode 3 (see sidebar). Any of the 140 factory/user presets may be assigned to any of the 128 available MIDI program slots so that each of your instrument's presets can have a different reverb sound. When you change the instrument preset, the DR1 will change accordingly. An increment preset mode allows you to predefine a sequence of presets, and cycle through them with a footswitch (this sequence can be the length of an entire set or it can cycle through just a few presets for a single song). Also, with the MIDI in and MIDI out/thru jacks, DR1s may be slaved together.

Performance MIDI controls any of the above programs and parameters in real time from any MIDI sending unit, such as a keyboard. Your only limitation is that only two parameters can be adjusted at any given time by two controllers. You can, however, use the same controller for two parameters or vice versa. You may also independently scale the parameter's response to the controller and set a center/start value. Both positive and negative scaling are supported.

The possibilities are many; for example, key number (i.e. the pitch of the note being played) may control reverb time while key velocity may control damping. Twenty-one different controllers are supported in all, such as note numbers, various continuous controllers, and different kinds of pedal controllers. Note that many keyboards allow you to disable their wheels from the internal sound generators yet still send wheel data over MIDI, which is convenient when controlling the reverb parameters. For example, a

Product Summary

Product: DR1 Performance MIDI
Type: MIDI compatible digital reverb
Retail Price: $1,295 (U.S.)
Bandwidth: 35 kHz dry, 14 kHz processed.
Dynamic Range: Over 90 dB.
Resolution: 16 bit.
Size: One standard rack height.
Decay Time: 0.1 to 25 seconds.
Factory/User Presets: 40/100 (140 total).
Room Types: 5 Plate, 5 Room, 5 Hall, 1 DDL, 1 Gated, 2 Effect, 1 Flange/Chorus, 1 Reverse.
MIDI Program: 0 to 127 assignable to any preset.
MIDI Control: 2 controllers per preset. Any of the supported channel voice messages (e.g. note on velocity), 14 bit controllers (e.g. mod wheel), or 7 bit controllers (e.g. hold pedal) may be used to control any of the available reverb parameters.
Manufacturer: Applied Research and Technology, Inc. 215 Tremont Street, Rochester, NY 14608; 716/436-2720; Telex: 4949793 ARTROC.

MIDI Modes 1 & 3

In Mode 1, commonly called "Omni" or "Omni On," the receiving instrument responds to the information being sent on all 16 channels. No channel assignment is necessary, since no matter which channel contains the transmitted data, the slave (DR1) will respond to this data.

In Mode 3, commonly called "Poly" or "Omni Off," the slave no longer looks for information on all channels but instead looks for information coming in over one specific channel. With this mode you must select the same channel for the transmitter and receiver.

mod wheel could control the position parameter, and a center return pitch wheel could control high frequency damping (i.e. center position is normal reverb, bend up adds brightness, and bend down increases damping). We're talking about the ability to do some fairly weird things.

Thanks to the scaling function, the effects may range from barely noticeable to the utmost in sledgehammer subtlety (however, you cannot adjust the minimum decay for dynamic reverb rooms). As a mental aid, when a particular parameter is under MIDI control its corresponding LED will blink and the value display will update on every received MIDI command. This greatly simplifies set up. The DR1 also has a few handy system exclusive routines as well, among them the ability to dump and load presets and take a "snapshot" of the current values for a given preset.

SUBJECTIVE EVALUATION

At this point you're probably saying, "Well everything seems spiffy so far, but how does it *sound*?" To answer that question, I hooked the DR1 through a mixing board and into a stereo playback monitor or instrument amp, depending on the test. Several sources were tried, including bass guitar, drums, a sampling keyboard, and voice. Quite simply, the DR1 has the flexibility to sound very good on all manner of source material. Of course, this flexibility means that it can also sound terrible if you misadjust it!

Of the factory presets, the 15 available "normal" reverbs sounded reasonable and covered everything from a *very* short plate to a huge hall. One or two of the plates were a bit too hot in the midrange and I generally found myself favoring the smaller halls and medium to short room plate programs. Generally the hall programs seem a bit smoother, pleasing, and more realistic. The factory sounds are a very good starting point, though I generally shortened the reverb and predelay times a bit, and adjusted the damping and diffusion for the desired effect. Extreme adjustments (e.g. extreme settings of the damping control) produced some very interesting sounds, albeit unnatural ones. High damping produces a sound reminiscent of a VCF closing, while low damping produce a hot, bright sound. Appropriate adjustments of the damping and position controls produces a tunnel, which is particularly effective at higher reverb times. The DR1 produces some very realistic reverbs without obvious distortion or noise, and the 14 kHz bandwidth makes for a clean top end too.

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The special effects are also very useable, although the gated presets are a little strange. The first one sounds far too loose and reminds me of a bag of marbles hitting a steel plate; the individual echoes are too obvious for my taste. The second one is light years ahead and sounds delicious on a snare drum. The settings on this one seem a little tricky, but a few quick alterations produced some good results. Another good way to generate gated reverbs is to use the decay kill K/I mode with the plate, room, and hall programs. The step type flange must be heard to be appreciated, but it's certainly not something you would use regularly (although it would probably be just the thing to spice up your answering machine message). The drone sounds would be familiar to anyone that ever played with the regeneration control on a short delay line. The "normal" flange/chorus presets are very useful, but the factory chorus has virtually no regeneration so you may wish to start there in your alterations. The great thing about these programs is that they're in stereo, so very exciting sounds are possible. As nice as these sounds are, though, I wouldn't throw out the MXR Flanger/Doubler! The flanging sounds from the DR1 (or any other comparable priced unit that I've heard) just don't seem to have the ultimate depth, roundness, and realism of an old dedicated unit. It's better to treat these programs as a different version of a flange or chorus than as a replacement.

Unlike the flange/chorus, the DDL presets do obsolete (for the most part) a dedicated unit. Many presets would normally require two delay units to achieve. The factory sounds include a ping-pong and echorec (a simulated tape echo effect). A little experimenting can produce effects like five quick echoes in the right speaker followed by five echoes in the left speaker a second later. I found the DDL section quite useful for doubling as well.

The dynamic rooms are just great. You can play at breakneck speed without getting a lot of clutter and then on that last held note—wham!—full, lush reverb. This is also very useful for drumkits as the fills are clearer than you would expect with long reverb times.

As far as Performance MIDI is concerned, it's guaranteed to turn you into a MIDIac. Some useful experiments include decreasing reverb time with increasing velocity (loud passages are up front, while the background sections remain laid back), increasing damping with increasing note number (provides bright bass passages without a screaming top end), or varying the drone frequency on the effect 2 program with note number.

However, the DR1 updates values while forgetting what it just did. For example, suppose note C1 has a reverb time of 25 seconds and note C5 is scaled for one second. If you hit C1 you will get this very long reverb but if you hit C5 immediately after, the reverb for both notes will go to one second. In other words, the parameters are being continually reset without continuing the parameters and sounds existing prior to the new MIDI message. While this effect can be heard easily on certain special pieces, I don't think that it would cause problems in ordinary performances except in special circumstances. As a matter of fact, I can think of several instances where I prefer this effect hands down.

I can't say enough about the remote. This is simply great. It's a nice size, and more importantly, it's full function; you're not limited to just calling up presets with this device. I've become so lazy that I do *all* of my preset programming and recall from this handy unit. The cord is a modular telephone type so you can extend it if need be.

> **"I can't say enough about the remote. This is simply great"**

I did have some minor troubles trying to hook certain instruments directly into the DR1; specifically, guitar and bass signals are too low and the DR1's input impedance isn't quite high enough. Actually this test is somewhat unfair since any passive instrument should go through a preamp first, but I know a few folks will run it without one anyway.

Overall, I would rate the DR1 as an excellent sounding unit with many attractive features at a very competitive price. Being a software-based unit the DR1 should keep pace into the future as well. One can only wonder what the engineers at ART are cooking up in their labs now. **EM**

DataBank

AC couple: To add a capacitor in series between audio stages. Capacitors, which block DC but pass AC (audio) signals, prevent the transfer of DC offset between stages.

Casio Inc.
15 Gardner Rd.
Fairfield, NJ 07006
201/575-7400

DC offset: A residual, typically small DC voltage at the output of an audio stage. If this DC offset gets into a subsequent amplification stage that is DC-coupled (allows DC signals through), this small voltage will become amplified, and possibly create problems (e.g. pushing a constant amount of current through the output load, such as a speaker).

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Los Angeles, CA 90025
213/473-8771

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Brea, CA 92621
714/990-0909

Grey Matter Response, Inc.
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Tinley Park, IL 60477
312/349-1889

Hercules Computer Technologies
2550 Ninth St.
Berkeley, CA 94710
415/540-6000

International Parts Specification Standard: A system of specifying electronic parts' values used throughout the world and in **EM**. This standard avoids the unnecessary use of zeroes, decimal points, and stating Ohms (Ω) or Farads (F) when implicitly understood. For example:

USA	Int'l
1.5 kΩ	1k5
2.2 MΩ	2M2
10µF	10µ
0.01µF	10n
3300pf	3n3
0.0022µF	2n2

where

k = kilo = 10^{-3} Ohms
M = Mega = 10^{6} Ohms
µ = micro = 10^{-6} Farads
n = nano = 10^{-9} Farads
p = pico = 10^{-12} Farads

Therefore, 100 nF is equivalent to 0.1 µF; and 20 nF equals 0.02 µF. Be *sure* that when ordering parts based on construction articles in this magazine that you understand the difference between, say, a 20 nF cap and a 20 µ capacitor. Don't expect a parts clerk to know what a nanofarad is.

Moog Electronics, Inc.
2500 Walden Avenue
Buffalo, NY 14225

Numera
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75013 Paris, France
(1) 45.87.17.56

Oberheim (ECC Development Corp.)
11650 W. Olympic Blvd.
Los Angeles, CA 90064
213/479-4948

Op amp follower: A buffer circuit that provides no gain, but isolates one stage from the loading effects of a subsequent, generally low-impedance stage.

Roland Corp US
7200 Dominion Circle
Los Angeles, CA 90040
213/685-5141

Shepard Function Generator: A circuit that generates the control voltages necessary to, when applied to multiple voltage-controlled oscillators, produce the audio illusion of a constantly rising or falling group of tones. This is also known as the "barberpole" effect since the visual effect of a barberpole is that of a constantly rising or falling group of stripes.

VCF: Voltage-controlled filter. A filter whose cutoff (or resonant) frequency can be adjusted by an applied control voltage, typically in the range of 0 to +5 or 0 to +10 Volts.

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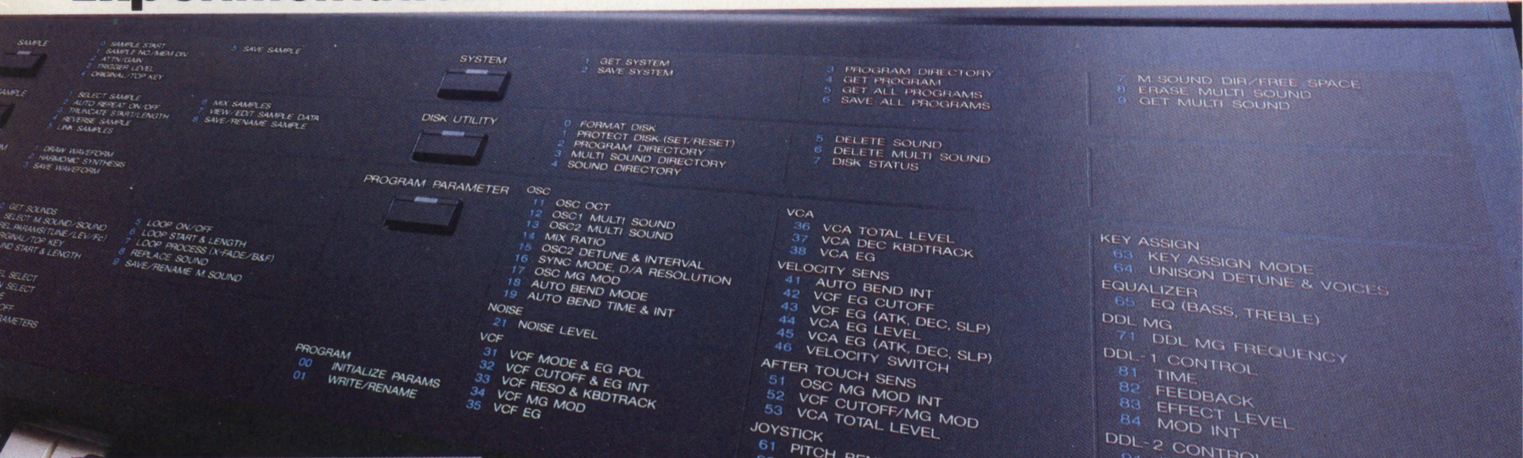
SAMPLE
0 SAMPLE START
1 SAMPLE NO./MEM DIV
2 ATTN/GAIN
3 TRIGGER LEVEL
4 ORIGINAL/TOP KEY
5 SAVE SAMPLE
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8 SAVE/RENAME SAMPLE
1 DRAW WAVEFORM
2 HARMONIC SYNTHESIS
3 SAVE WAVEFORM
0 GET SOUNDS
SELECT M.SOUND/SOUND
REL PARAMS(TUNE/LEV/Fc)
ORIGINAL/TOP KEY
SOUND START & LENGTH
5 LOOP ON/OFF
6 LOOP START & LENGTH
7 LOOP PROCESS (X-FADE/B&F)
8 REPLACE SOUND
9 SAVE/RENAME M.SOUND
SYSTEM
1 GET SYSTEM
2 SAVE SYSTEM
DISK UTILITY
0 FORMAT DISK
1 PROTECT DISK (SET/RESET)
2 PROGRAM DIRECTORY
3 MULTI SOUND DIRECTORY
4 SOUND DIRECTORY
PROGRAM PARAMETER
3 PROGRAM DIRECTORY
4 GET PROGRAM
5 GET ALL PROGRAMS
6 SAVE ALL PROGRAMS
5 DELETE SOUND
6 DELETE MULTI SOUND
7 DISK STATUS
7 M.SOUND DIR/FREE SPACE
8 ERASE MULTI SOUND
9 GET MULTI SOUND
OSC
11 OSC OCT
12 OSC1 MULTI SOUND
13 OSC2 MULTI SOUND
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16 SYNC MODE, D/A RESOLUTION
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NOISE
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VCF
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32 VCF CUTOFF & EG INT
33 VCF RESO & KBDTRACK
34 VCF MG MOD
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PROGRAM
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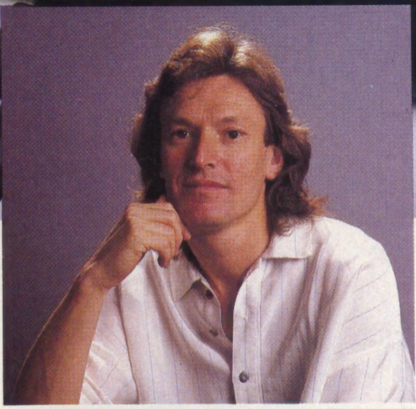
VELOCITY SENS
41 AUTO BEND INT
42 VCF EG CUTOFF
43 VCF EG (ATK, DEC, SLP)
44 VCA EG LEVEL
45 VCA EG (ATK, DEC, SLP)
46 VELOCITY SWITCH
AFTER TOUCH SENS
51 OSC MG MOD INT
52 VCF CUTOFF/MG MOD
53 VCA TOTAL LEVEL
JOYSTICK
61 PITCH BEND RANGE
62 VCF SWEEP ON/OFF
KEY ASSIGN
63 KEY ASSIGN MODE
64 UNISON DETUNE & VOICES
EQUALIZER
65 EQ (BASS, TREBLE)
DDL MG
71 DDL MG FREQUENCY
DDL-1 CONTROL
81 TIME
82 FEEDBACK
83 EFFECT LEVEL
84 MOD INT
DDL-2 CONTROL
91 INPUT SIGNAL SELECT
92 TIME
93 FEEDBACK
94 EFFECT LEVEL
95 MOD INT
96 MOD INVERT SW



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The DSS-1's power is easy to use, so you can work with sound and music, not programming manuals. The backlit 40 character LCD display takes you through the total sound generation process with options and instructions at every step. Software that talks your language and a logical front panel menu help you go beyond synthesis, beyond sampling — without dictating your direction.

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Unlike other samplers, the DSS-1 lets you access 128 sounds without changing a disk. Each disk stores four Systems of 32 sounds. Within each System, your programs combine up to 16 sample groups and/or waveforms with complete sets of synthesis parameters and keyboard setups. In effect, the DSS-1 becomes a new instrument every time you call up a System. The library of easily available 3½″ disks is already substantial and growing fast. Four disks — each with 128 sounds — are supplied with the DSS-1 to start your comprehensive Korg sampling library.

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